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July-August 1961

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American Geological Institute

Calendar

Cooperation of Society Secretaries in supplying meeting notices for GEOTIMES calendar is requested.

July 17-22—INTERNAT. CONF. ON SOIL MECHANICS & FOUNDATION ENGINEERING, 5th, Paris, France. M. Buisson, Gen. Sec'y., Assoc. Francaise de Mech. des Sols et des Fondations, 31, rue Henri Rochefort, Paris 17e, France.

July 30-Aug. 4, 1961—AMER. CRYSTALLOGRAPHIC ASSOC., Boulder, Colo.

Aug. 21-31, 1961—U.N. CONF. ON NEW SOURCES OF ENERGY, (Solar Energy, Wind Power and Geothermic Energy), Rome. Write: U.N., New York.

Aug. 21-Sept. 6 — PACIFIC SCIENCE CONGRESS, 10th, Honolulu, Hawaii. Pacific Science Assoc. Secretary General, 10th Pacif. Sci. Cong., Bishop Museum, Honolulu 7, Hawaii.

Aug. 21-Sept. 6—SPECIAL COMMITTEE ON OCEANIC RESEARCH, 5th Meeting, Honolulu. Dr. Günther Böhnecke, Secy., Bernhard-Nochstr. 78, Hamburg 4, Germany.

*Aug. 27-31, 1961—PALEOBOTANICAL SECT. of Bot. Soc. of Amer. meeting with A.I.B.S. Purdue Univ., Lafayette, Ind. Regular papers and special Pleistocene symposium. Field trip to strip mines near Coal City, Ill. Write: Theodore Delevoryas, Dept. of Botany, Univ. of Ill., Urbana, Ill.

Aug. 27-Sept. 21, 1961—INTERNAT. ASSOC. ON QUATERNARY RESEARCH, 6th Internat. Congress, Warsaw, Poland.

Summer—INTERNAT. COUNCIL OF SCIENTIFIC UNIONS, 9th General Assembly, London, Eng. National Academy of Sciences-National Research Council, Washington 25, D. C.

September, 1961 — INTERNAT. PALEONTOLOGICAL UNION/MEDITERRANEAN NEOCENE COMMITTEE, Meeting, Sabadell, Spain. Write: J. Roger, Serv. d'Information Geol. du B.R.G.M., 74, rue de la Federation Paris 15.

Sept. 3-8, 1961—AMER. CHEM. SOC., 140th meeting, Chicago, Ill.

*Sept. 7-9, 1961 — ALBERTA SOC. PETROL. GEOL. & GEOL. ASSOC. CANADA, jointly sponsored convention and field trip, Calgary. Theme—Canadian Sedimentary Basins. Papers 2 days, trip 1 day. Write: J. S. Crewson, 401 Natural Gas Bldg., Calgary, Alta., Canada.

Sept. 18-23—III INTERNAT. CONGRESS OF SPELEOLOGY, Vienna, with excursions before and after the meetings. Write: Generalsekretariat des 3. Internationalen Kongresses für Speläologie, Verband österreichischer Höhlenforscher, Wien II, Obere Donaustrasse 99/7/3.

Sept. 25-30, 1961 — INTERNAT. CONF. ON MAGNETISM AND CRYSTALLOGRAPHY, Kyoto Kaikan Assembly Center, Kyoto, Japan. Write: Organizing Comm., Science Council of Japan, Ueno Park, Tokyo, Japan.

Sept. 28-29, 1961—INTERNAT. GEOPHYSICS ASSOC., Colloquium, Salzburg. Write: the Assoc., Freisaalgasse 31, Salzburg, Austria.

Oct. (9-10 days) 1961—SYMPOSIUM ON THE FORMATION OF IGNIMBRITES, HYALOCLASTITES AND RELATED DEPOSITS, Catania, Sicily. Write: Prof. A. Rittmann, Pres., Internat. Assoc. of Volcanology, c/o Dept. of Volcanology, Catania Univ., Catania, Sicily.

Oct. 2-7, 1961 — UNESCO-WMO SYMPOSIUM ON CHANGES OF CLIMATE, with special reference to the Arid Zones, FAO Headquarters, Rome. Write: UNESCO, Dept. of Nat. Sci.

Oct. 8-11, 1961—AIME: Soc. of Petr. Engrs., Fall meeting, Dallas, Texas.

Oct. 9-12, 1961 — SYMPOSIUM ON RECENT DEVELOPMENTS IN RESEARCH METHODS AND INSTRUMENTATION, Nat. Inst. of Health, Bethesda, Md. Write: James B. Davis, N.I.H., Bethesda 14, Md.

Oct. 13-15, 1961—CALIF. ASSOC. ENGR. GEOLOGISTS, 4th Ann. Meeting, Hotel Senator, Sacramento, Calif. Papers, 1 Symposium, Field trip, 1 day each. Write: W. W. Peak, P. O. Box 4164, Sacramento 21, Calif.

Oct. 13-20, 1961—INTERNAT. ASSOC. OF SCIENTIFIC HYDROLOGY, symposium on Methods of Evaluating resources of Underground Water with Emphasis on Arid Zone Problems, Athens. Write: the Assoc., 61, rue des Ronces, Gentbrugge, Belgium.

*Oct. 14-18, 1961—NATIONAL CLAY CONF., Univ. of Texas, Austin. Field trip Oct. 14 to bentonite localities of Texas Gulf Coast and vermiculite field trip Oct. 15. Write: E. Joseph Weiss re program or papers and Stephen E. Clabaugh re field trips, both at Univ. of Texas.

Oct. 18-20, 1961—OPTICAL SOC. OF AMER., Ann. Meeting, Los Angeles, Calif.

Oct. 18-21, 1961—AAPG: Mid-Cont. Regional meeting, Amarillo, Texas.

Oct. 25-27, 1961—GULF COAST ASSOC. OF GEOL. SOC's., meeting, Granada Hotel, San Antonio, Tex.

Oct. 30-Nov. 1, 1961—SVP: Ann. Meeting, Chicago Nat. Hist. Mus., Chicago.

Oct. or Nov. 1961 — INTERNAT. MINING CONVENTION, El Paso, Texas. Write: M. Hopper, 310 San Francisco St., El Paso.

*Nov. 1-3, 1961—SOUTHWESTERN FED. OF GEOL. SOC'S., Ann. Meeting. El Paso, Tex. Trip into northern Chihuahua, Mex. to study geol. of the area. Write: Texas Western Coll., Geol. Dept., El Paso.

Nov. 2-3, 1961—AIME: Soc. of Petr. Engrs., 32nd Ann. California regional meeting, Los Angeles, Calif.

*Nov. 2-4, 1961—GSA: Ann. Meeting, Cincinnati, Ohio. Nine trips through area around Cincinnati to study Paleozoic stratig. and struct.; Write: Ralph J. Bernhagen, Ohio Geol. Surv., Ohio State Univ., Columbus 10. re trips. Guidebooks.

Nov. 5-9. 1961—SEGp: 31st Ann. Internat. Meeting, Hilton Hotel, Denver, Colo. Write: R. C. Holmer, 516 Acoma St., Denver 4, Colo.

Nov. 13-15, 1961—A.P.I.: Ann. Meeting, Chicago.

Nov. 15-17, 1961—EASTERN ANALYTICAL SYMPOSIUM, Hotel Statler Hilton, New York City.

Dec. 26-31, 1961—AAAS: Ann. Meeting, Denver, Colorado.

*Dec. 7-9, 1961—NAGT, Texas Sect., & Texas Acad. of Sci., Joint Ann. Meetings, and half day trip through Gulf Coastal area on Dec. 9. Write: J. W. Dixon, Dept. Geol., Baylor Univ., Waco, Texas.

1962

Jan. 8-12, 1962 — HIGHWAY RESEARCH BOARD, Ann. Meeting, Sheraton-Park Hotel, Washington, D.C.

Feb. 7-9, 1962—CANADIAN INST. OF SURV. & PHOTOGRAM., Ann. Meeting, Ottawa, Ont., Canada.

Feb. 18-22, 1962—AIME; Ann. Meeting, New York City.

Mar. 11-17, 1962—ACSM-ASP: Ann. Meeting, Shoreham Hotel, Washington, D. C.

Mar. 15-17, 1962—OPTICAL SOC. OF AMERICA, Meeting, Washington, D. C.

Mar. 20-29, 1962—AMER. CHEM. SOC.: 141st Meeting, Washington, D. C.

Mar. 26-29, 1962—AAPG-SEPM: 47th Ann. Meeting, Civic Auditorium hdqtrs., Hdqtrs. Hotel, Fairmont Hotel, San Francisco, Calif.

April 13-14, 1962—IOWA ACAD. OF SCI., Ann. Meeting. Write: Paul F. Romberg, Iowa State Univ., Ames, Iowa.

April 16-21, 1962—INTERNAT. MINERALOGICAL ASSOC., 3rd Congress, Washington, D.C. Write: D. J. Fisher, Dept. of Geol., Univ. of Chicago, Chicago 37, Ill.

April 23-25, 1962—AAPG: Rocky Mountain Sect., Salt Lake City, Utah.

April 23-25, 1962—CIM: Annual General Meeting, Chateau Laurier, Ottawa, Ont., Canada.

April 23-28, 1962—INTERNAT. CONF. ON PALYNOLOGY, Tucson, Ariz. Write: Palyn. Conf. Planning Comm., Geochronology Labs., Univ. of Arizona, Tucson.

April 29-May 3, 1962—ACerS: 64th Ann. Meeting, New York City.

May 2-4, 1962—COUNCIL OF ENGINEERING SOCIETY SECRETARIES, Royal York Hotel, Toronto, Ont., Canada.

May 7-8, 1962—AIME: Soc. of Petroleum Engrs., 5th Biennial Secondary Recovery Symposium, Wichita Falls, Texas.

May 8-?—7th INTERNAT. HYDROGRAPHIC CONF., Monte Carlo, Monaco. Write: Internat. Hydr. Bur., Quai des Etats-Unis, Monte Carlo.

May 24-25, 1962 — AIME: Soc. of Petroleum Engrs., Ann. Joint Meeting, Rocky Mountain Petroleum Sect's., Billings, Mont.

May-June, 1962—SYMPOSIUM ON THE PREDICTION OF TIME AND PLACE OF VOLCANIC ERUPTIONS and the relationship between magmas and the nature of volcanic eruptions, Tokyo. Write: Prof. A. Rittmann, Internat. Assoc. of Volcanology, c/o Dept. of Volcanology, Catania Univ., Catania, Sicily.

June 4-7, 1962—SEVENTH NUCLEAR CONGRESS, New York City. Write: E.J.C., 29 W. 39th St., New York 18.

July 9-14, 1962—INTERNAT. CONGRESS ON GLASS, 6th, Washington, D. C. Write: C. H. Hahner, Internat. Comm. on Glass, c/o Glass Section, Nat. Bur. of Standards, Washington 25, D. C.

Sept. 9-14, 1962—AMER. CHEM. SOC.: 142nd Meeting, Atlantic City, N.J.

Sept. 17-20, 1962—SEGp: 32nd Ann. Internat. Meeting, Calgary, Alta., Canada.

Oct. 3-5, 1962 (tentative) — SOUTHWESTERN FED. OF GEOL. SOC's., Ann. Meeting, Dallas, Tex.

Oct. 7-10, 1962 — AIME: Soc. of Petroleum Engrs., Fall Meeting, Los Angeles, Calif.

Oct. 31-Nov. 3, 1962—GULF COAST ASSOC. OF GEOL. SOC's., New Orleans, La.

Nov. 5-9, 1962—THIRD WORLD METALLURGICAL CONG., Chicago, Ill. Write: Chester Wells, ASM, 7301 Euclid Ave., Cleveland 3, O.

Nov. 12-14, 1962—GSA: Annual Meeting, Houston, Tex.

Nov. 12-14, 1962—A.P.I., Ann. Meeting, Chicago.

Dec. 26-31, 1962—AAAS: Ann. Meeting, Boston, Mass. (tentative).

1961 SCHEDULE OF FIELD TRIPS

For additional field trips held in conjunction with meetings, see those items marked with an asterisk under meeting calendar.

July 31-Aug. 3—SOC. OF VERT. PALEONTOLOGY, field conf. to fossil vertebrate localities in NW Nebraska, Oligocene to Pleistocene. Write: Bertrand Schultz, Univ. of Nebraska, State Museum, Lincoln 8, Neb.

Aug. 2-5—WYOMING GEOL. ASSOC., 16th Ann. Field Conf. Trip to portions of Green River Basin, Rawlins Uplift, Wind River Basin and W. flank of Powder River Basin to study post-Cody and pre-Eocene stratig. Write: WGA, P.O. Box 545, Casper, Wyo.

Aug. 18-19—EDMONTON GEOL. SOC., 3rd Ann. Field Trip, to Jasper in Canad. Rockies to study structure and Paleozoic stratig. Early notice of proposed attendance must be given as accommodation is limited. Write: R. H. Edmunds, P. O. Box 186, Edmonton, Alta.

Aug. 25-26 — FRIENDS OF THE PLEISTOCENE, Rocky Mountain Section, 7th Ann. Field Conf., Bear Lake-American Falls, Ida. Write for inf. and reservations: J. Stewart Williams, Utah State U., Logan.

Sept. 7-8—ROCKY MOUNTAIN ASSOC. OF GEOLOGISTS, field conf. to study pre-Pennsylvanian section in Salida, Monarch, Ouray, Silverton and Durango areas. Technical session in Salida night of Sept. 6. Write: Conf. chairman D. W. Bergman, 315 Colorado Bldg., Denver, Colo. Guidebook.

Sept. 7-9—ALBERTA SOC. PETROL. GEOL., trip to Turner Valley, Savannah Creek and Kananaskis Lakes, southwest Calgary foothills and mountains to study mountain structures and Paleozoic and Mesozoic stratig. Write: H. G. Gammell, 528 9th Ave., W., Calgary, Alta. Guidebook.

Sept. 14-16—KANSAS GEOL. SOC., 26th Ann. Field Conf., Mark Twain Hotel, Hannibal, Mo. Trip to Mississippi R. Valley between St. Louis and Hannibal to study boundary problems of lower Miss. section. Write: Orvie L. Howell, c/o Lario Oil & Gas Co., 301 So. Market, Wichita, Kans.

Oct. 5-8—NEW MEXICO GEOL. SOC., trip to Sandia Mtns., Hagan Basin, Jemez Mtns. in SE San Juan Basin and Lucero Uplift to study geology of Albuquerque area. Write: Charles Reed, USGS, Box 4083, Albuquerque. Guidebook.

Oct. 6-8—ATLANTIC COASTAL PLAIN GEOL. ASSOC., 2nd Ann. Field Conf. Trip to Cretac. and Tert. localities in N. J., Del. and Md. Write: H. G. Richards, Acad. of Nat. Sci., 19th & Parkway, Phila. 3, Pa.

Oct. 7—UTAH GEOL. SOC., trip to Bingham mining district and adjacent Oquirrh Mtns. to study stratig. and struct. of district and mountains. Write: Douglas R. Cook, 1935 S. Main St., Salt Lake City. Guidebook.

Oct. 13-15—NEW ENGLAND INTERCOLL. GEOL. CONF., trip to Green Mountain and eastern highlands of Conn. Valley to study glacial geology in central and west, economics of talc, asbestos and granite and structure in N. part of state. Write: C. G. Doll, East Hall, Univ. Vermont, Burlington, Vt.

Oct. 14-15—TRI-STATE FIELD CONF., of Iowa, Ill. and Wisc.; trip to SW Ill. to study probably lower Penn. and upper Miss. strat. and sedimentation. Write: S. E. Harris, Jr., Geol. Dept., So. Ill. Univ., Carbondale, Ill.

Oct. 18-21—WEST TEXAS GEOL. SOC., trip to Coke, Nolan, Fisher and Stonewall Co's. Texas to study Permian stratig. and oil fields of the area. Write: Martin L. Johnson, Box 1540, Midland, Texas. Guidebook.

October—ASSOC. OF MISSOURI GEOL., trip to St. Francois Mtns. of Ozark Uplift to study Precambrian and engineering geology. Write: W. C. Hayes, Mo. Geol. Surv., Box 250, Rolla, Mo. Guidebook.

FIELD TRIP CALENDAR

Most of the information regarding field trips in this calendar appears through the courtesy and cooperation of the AAPG Field Trip Committee. Corrections, additions and new trip notices should be sent to Edward E. Rue, AAPG Field Trip Committee, 216-19 King City Building, Mount Vernon, Ill., with a carbon copy to GeoTimes Calendar, American Geological Institute, 2101 Constitution Ave., N.W., Washington 25, D.C.

This Month in GEOTIMES

Professional News Magazine

Published by **THE AMERICAN GEOLOGICAL INSTITUTE**

Robert C. Stephenson, EDITOR

Kathryn Lohman, CIRCULATION MANAGER

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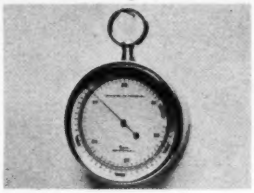
PROFESSIONAL INSTRUMENTS

.... from WARD'S

OUR 99TH YEAR

ALTITUDE BAROMETER by TAYLOR



Altitude Barometers. A necessary item in the working equipment of geologists. This precision instrument has a chrome-plated brass case with a 3" diameter dial. Supplied in a velvet-lined leather carrying case. Choice of three dial graduations:

C 2058.1	6,000 ft.	in 20' divisions	97.50
C 2058.2	10,000 ft.	in 50' divisions	97.50
C 2058.3	16,000 ft.	in 50' divisions	97.50

RANGER COMPASS by SILVA

TYPE 15 RANGER

- Liquid Filled
- Sighting Mirror
- Transparent Protractor Plate
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- Transparent Housing

Approved and used by professional people around the world. Truly a proficient instrument for foresters, geologists, surveyors, scientific explorers, sportsmen, and others demanding accuracy, speed, and utility. Many appraise this model as the world's best hand compass. Army model in several countries. Sighting mirror for speed and exactness. Built-in mechanism to adjust for magnetic declination. Transparent base plate and transparent housing for accurate bearings from a map or chart. Highly magnetized needle encased in liquid. Sapphire jewel bearing. Luminous points. Waterproof. Handy size and light weight. Dial graduated 0° to 360°. Engineer's scale in inches and tenths of an inch on one side of base plate. Millimeter scale on other side. Instructions. Size: 4" x 2½ x ¾". Weight: 3 oz.

C 2102	14.95
Leather case C 2102.1	3.25

ALL-METAL CONTACT GONIOMETER by WARD'S

C 3502 Ward's All-Metal Contact Goniometer. A durable, accurate contact goniometer has been needed for many years! Ward's now introduces a design that will hold up and can be a **permanent** instrument for every geologist and geology student! This new unit outperforms and outlasts former models made of cardboard and plastic. Quick, rapid method for accurate measurements of the angles of crystal specimens. Each individually packed in a sturdy manila envelope with instructions.

In stock for immediate shipment. Each	1.50
In lots of ten, each	1.35

NEW BROAD SPECTRUM LAMP by MINERAL EQUIPMENT

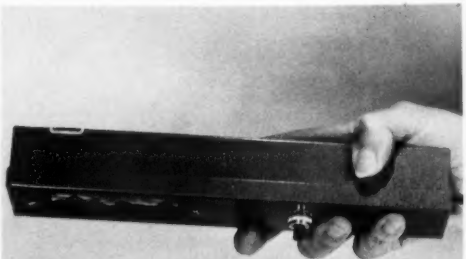
C 5634 Broad Spectrum Ultraviolet Lamp. This new exclusive light source puts out a full amount of brilliant short wave ultraviolet plus a copious amount of long wave ultraviolet at the same time! A new high in **combined** ultraviolet efficiency. Only **one** filter, **one** tube, **and one** push-button to operate!

The unit operates on ordinary house current. It is excellent for small school displays and for demonstration teaching where the intricacies of long and short wave need not be explained; these sometimes detract from the phenomenon of the principle of ultraviolet.

Also useful for field prospecting for tungsten, uranium, zirconium, ruby, and zinc. For field use it is used with the battery adapter unit.

This remarkable new lamp has an Alzak reflector and a Full-range filter for brilliance and coverage. Both filter and tube are rubber cushioned for protection from shock. Two coats of baked finish in durable, handsome, gray hammertone. Size 10" long x 2" wide x 1½" deep. Shipping weight, 3 lbs. 24.95 ea.

C 5634.1	Replacement tube	6.50 ea.
C 5634.2	Replacement filter	6.00 ea.
C 5634.3	Battery Case complete with batteries, used for field operation of lamp	12.95 ea.



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WARD'S NATURAL SCIENCE ESTABLISHMENT, INC.

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Today / Tomorrow

COMMITTEE OF 1000 FOR AGI now has nearly eleven hundred members (story on page 24). Contributions of individual geological scientists have constituted the largest source of income for the general support of AGI activities in fiscal year 1961. Small contributions combined with those of members of the Committees of 100 and 1000 amounted to about $23,000 over the past 12 months.

The Institute recently received a grant from the NSF to support a two-year Course Content & Curriculum Study for undergraduate training of geological scientists in colleges and universities. A Steering Committee will establish task force groups to undertake specific aspects of the study. Progress will be reviewed at various stages in open meetings. Guidelines for curricula and content of courses will be issued in the final report. The project will start in the Fall.

AGI President Campbell recently instructed a Nominating Committee consisting of Drs. Carl C. Branson, Robert M. Grogan and Samuel P. Ellison, Chairman, to propose a slate of officers. Institute officers elected by the Board of Directors in November will serve for a period of one year.

Shall I Study Geological Sciences?, the AGI career booklet has recently been reprinted with minor revisions of the sections on educational requirements and the employment outlook. The booklet has significant value in educating the general public as to the realm of the geological scientists as well as providing career guidance assistance to science-oriented students. Thirty-thousand of these booklets have been distributed over the past three years.

Five internationally-recognized geological scientists will be invited to participate in the third AGI Visiting International Scientist Program during the coming academic year. PhD departments and various research laboratories were invited to nominate scientists for consideration by the Selection Committee consisting of Drs. Frederick Betz, Albert V. Carozzi, Konrad B. Krauskopf, Raymond C. Moore, J. Frank Schairer, Brian J. Skinner, and C. J. Roy ex officio (Chairman, AGI Education Committee) that met in Washington on May 25.

More than 2500 copies of the AGI Glossary of Geology and Related Sciences with Supplement (Howell, Weller and others, 2nd Edit., 1960) have been sold since the new edition was released last December. In addition, 1600 copies of the supplement alone have been sold (see adv., page 52).

Educators to the Front

A large number of geologist-educators will take to the soap box at the drop of a hat to propound their own pet ideas as to the shortcomings of geology, geological education and geologists—individually and collectively. Some soul searching might be in order, along with the finger pointing.

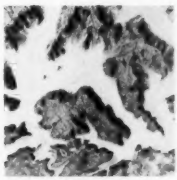
Largely as a result of the tremendous shot in the arm being given elementary and secondary school science programs by the course improvement efforts of other disciplines, at least 10 states have introduced or will introduce an earth science course in their school science curriculum. This is being done with little pressure and even less real assistance from geological scientists—and whether geologists like the idea or not.

The big problem in the trend toward earth science courses is the dearth of science teachers with adequate background in the subject matter. What's being done about it? Here is one example: Recently the NSF announced that it was supporting 236 in-service institutes for secondary teachers in science and math during 1961-62 through grants of $2.7 million. Of the 236 institutes, 22 will include earth science. Grants for these institutes went to 1 geography, 1 astronomy and 3 geology departments, with the remaining 17 going to departments of other disciplines.

Geologist-educators have been reluctant to recognize this teacher training problem and even more reluctant to do something positive about it. Is the training of school science teachers beneath their station?

In other disciplines, scientists of great stature have given most generously of their time, energy and broad experience in attacking burdgeoning school science problems. Among these are Glenn Seaborg, the Nobel Prize-winning chemist; Bentley Glass, the prominent biologist; and Jerrold L. Zacharias of MIT who has headed the multimillion dollar PSSC massive course improvement effort in physics. Are there geologist-educators of such stature who are ready to step forward and to work shoulder to shoulder for the common advancement of geological education?

AGI has had and will continue to have an education program involving various kinds of activities where geologist-educators (and other geologists), who are interested in working on education problems in geology, will find it possible to give generously of their efforts on behalf of our beloved profession.



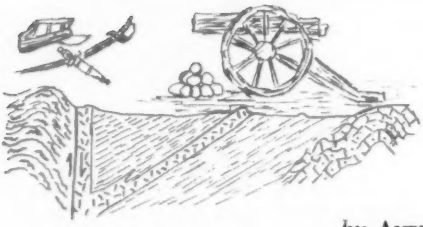
OUR COVER

Aerial photograph of the rugged desert and mountainous terrain in remote eastern Jordan. *Photo by courtesy Aero Service Corp.*

The **AMERICAN GEOLOGICAL INSTITUTE** is a non-profit professional service organization established and managed by the scientific societies in the fields of geology and geophysics in cooperation with the National Academy of Sciences-National Research Council. It is the instrument of the profession serving and advancing the welfare of the geoscientist in matters relating to education, professional responsibilities and government relations. It is an active member of the Scientific Manpower Commission. It also functions in the stimulation of public education and awareness of the earth sciences, through career literature, the scouting program and other channels of communication.

GEOTIMES is the news magazine of the geological sciences. It reports on current events in the earth sciences, public education and public relations efforts throughout the profession, as well as appropriate legislative and governmental issues. It announces scholarships, fellowships, publications and new developments. It provides a forum for discussion of timely professional problems, and affords a common bond between the many specialized groups within the earth sciences.

Geology *and the* Gettysburg Campaign



by ANDREW BROWN [1]

Each year thousands of sightseers clamber over Little Round Top and Devils Den on the Gettysburg battlefield, and gaze with awe over the mile of treeless plain across which Pickett's men charged toward "the little clump of trees" on July 3, 1863. All are impressed by the rocky heights—the Round Tops, Cemetery Ridge, Cemetery Hill, and Culps Hill—against which Lee's men hurled themselves in vain throughout three days of bitter fighting. Few, however, know that these heights are the outcrop of a diabase sill, appropriately enough called the Gettysburg sill, that about 180 million years ago intruded the Triassic sandstones and shales that floor the broad Gettysburg plain. Even fewer have any concept of the extent to which the movements of the two armies toward Gettysburg, and the battle itself, were influenced by the geology of the region in which the campaign was conducted.

The Gettysburg battlefield covers an area of about 15 square miles. The battle, however, was but the climax of a campaign that covered an area of about 11,000 square miles. This area is approximately 140 miles long—from Fredericksburg on the Rappahannock River in Virginia to Harrisburg on the Susquehanna River in Pennsylvania—and 80 miles wide—from a line drawn on the southeast through Fredericksburg, Washington, and Baltimore, to the northwestern edge of the Great Valley of Virginia, Maryland, and Pennsylvania (see fig. 1). A further idea of the immensity of the military effort that reached its culmination in Pickett's charge is gained from the mere fact that the campaign started on June 3 at Fredericksburg, reached its climax on July 3 at Gettysburg, and did not end until the Confederate army recrossed the Potomac into Virginia on July 14.

At the time of the Civil War the science of geology was young, and military geology, as the term is understood today, was years in the future. Yet the principles of military geology, applied or all too often not applied, influenced decisively the outcome of more than one campaign. The Gettysburg campaign is an excellent example of intelligent use by commanders of both armies of terrain and topography and, therefore, of geology.

[1] ANDREW BROWN, U. S. Geological Survey Washington, D. C., is an avid student of Civil War history.

THE ADVANCE TO GETTYSBURG

June 3 to June 30, 1863

The region in which the Gettysburg campaign was conducted (fig. 1) falls into four roughly parallel bands. From southeast to northwest these are the Piedmont proper; the Triassic basins, including the Culpeper Basin in Virginia and Maryland and the Gettysburg Basin in Maryland and Pennsylvania; the Blue Ridge of Virginia and its continuation, South Mountain, in Maryland and Pennsylvania; and the Great Valley, including approximately the northern half of the Shenandoah Valley in Virginia, the Hagerstown Valley in Maryland and Pennsylvania, and the Cumberland Valley in Pennsylvania. Each of these four regions played a distinctive role in the Gettysburg campaign.

After the campaigns of 1862 the Confederates went into winter quarters on the

south bank of the Rappahannock River, the Union armies on the northern bank. The Rappahannock and its tributary, the Rapidan, which joins it about 10 miles west of Fredericksburg, flow eastward across the entire 50-mile width of the Piedmont in steep, easily defended valleys, and were in effect the outermost defense line of Richmond. In this area the Piedmont rises from approximate sea level at Fredericksburg, Washington, and Baltimore, to about 400 or 500 feet near the Blue Ridge. The exposed rocks, mostly of Precambrian age, are granite, gabbro, and hornblende gneiss in the southeastern part and the Wissahickon Schist in the northwestern part of the Piedmont. The rocky roads of this region of ridges and ravines were hard on men, animals, and equipment, so were to be avoided by the armies of the sixties. To use a term coined later by military geologists, the "trafficability" of the roads was poor. Although the Gettysburg campaign started in the Piedmont, both armies left it as soon as possible.

At Fredericksburg in December 1862 and at Chancellorsville in May 1863 Union armies attempted, with disastrous results, to breach the Confederates' river lines. After his great victory at Chancellorsville Gen. Robert E. Lee, commanding the Confederate Army of Northern Virginia, decided to invade Federal territory. He built up his army to a strength of 70,000 to 80,000 men (exact figures are impossible to obtain) and about 250 pieces of artillery. He divided his infantry into three corps of about 20,000 men each; the First Corps was commanded by Gen. James A. Longstreet; the Second Corps by Gen. R. S. Ewell; and the Third Corps by Gen. A. P. Hill. The cavalry, about 10,000 strong, was commanded by Gen. J. E. B. Stuart.

Facing the Confederates across the Rappahannock was the Union Army of the Potomac, about 100,000 strong, commanded by Gen. Joseph A. Hooker. Hooker had about 350 pieces of artillery; his infantry was divided into seven corps, each approximately half the size of a Confederate corps; his cavalry, commanded by Gen. Alfred Pleasanton, was about 13,000 strong.

Lee's reasons for invading the North were political, military, and economic. Politically, the prospect of European intervention on the side of the Confederacy would be greatly enhanced by a decisive victory on northern soil. The military objective was the capture of Harrisburg, the capital of Pennsylvania. With Harrisburg in his hands Lee could threaten Philadelphia, Baltimore, or Washington as circumstances might make advisable, and he could also cut the Pennsylvania Railroad, a vital supply line for the Union armies. Such a campaign was a sound if bold concept, particularly as Lee counted on outmarching the Army of the Potomac and meeting with no opposition except that of militia.

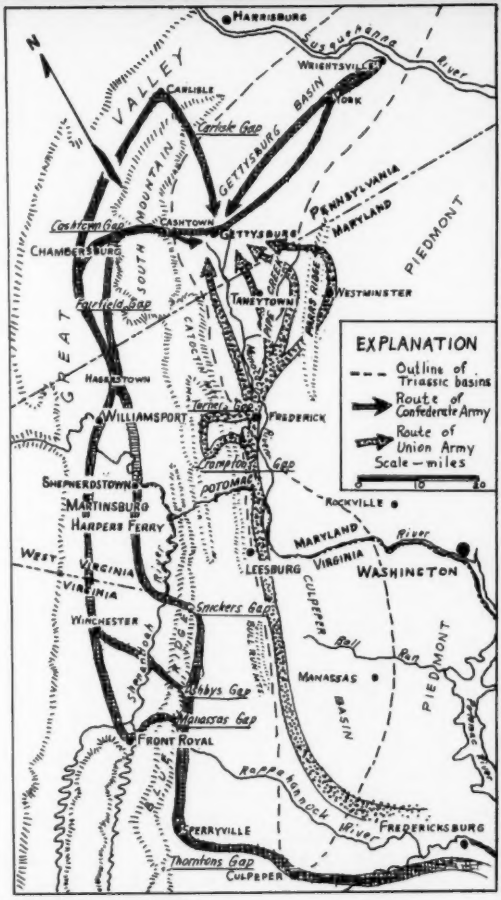


Figure 1. Sketch map of the area covered by the Gettysburg campaign.

The economic reason for the campaign had to do with such mundane things as food, forage, horses, shoes—in fact almost everything an army needs except ammunition, with which the Confederates were well supplied. The Confederate commissary system, never good, had so broken down that the army had no alternative but to "live off the country"—not in the friendly Shenandoah Valley, but in the hostile Hagerstown and Cumberland Valleys.

The Gettysburg campaign began on June 3, 1863. On that day Ewell's Corps

of the Army of Northern Virginia left Fredericksburg, marching by way of Culpeper toward the Blue Ridge and the Great Valley. A glance at the map might give the impression that the Confederate commander was taking a roundabout route to Harrisburg, but it was in fact the only practicable road. Lee, outnumbered as he knew he was, could not hope to drive the Union army northward and across the Potomac by a frontal attack, but the situation was almost ideal for a flanking movement. Using the Blue Ridge as a barrier, and marching in the wide, fairly level Great Valley, the Confederates were not only safe from attack but to a surprising degree safe from observation. The Blue Ridge and the Valley, therefore, were the keys to Lee's strategy.

In Virginia the Blue Ridge is high and rather narrow, formed of tightly folded and metamorphosed quartzite and volcanics, gneiss and other resistant rocks mostly of early Paleozoic age. The crest of the ridge drops from about 4,000 feet south of Thorntons Gap to 1,500 feet at the Potomac, where it is known locally as Loudon Heights. An extension, Elk Ridge, continues about 10 miles into Maryland; the southern end of Elk Ridge is known as Maryland Heights. At the Potomac River the main ridge is offset about 3 miles to the east, and an extension, Short Mountain, continues for about 10 miles into Virginia. Near the Maryland-Pennsylvania State line a spur of South Mountain, the Catoctin Range, swings eastward and southward into Virginia, passing a few miles west of Frederick, Maryland. The Bull Run Mountains in Virginia are an interrupted extension of the Catoctin Range.

South Mountain in Pennsylvania and northern Maryland is wider and more complex in structure than the Virginia Blue Ridge, though it is formed by the same rock types. Altitudes of the crest in that region range from about 1,500 feet at the Potomac to 2,000 feet near Carlisle.

Of military importance equal to the Blue Ridge and South Mountains were the gaps which, so to speak, are the doors in the mountain wall. The only water gap in the area of the Gettysburg campaign is at Harpers Ferry where the Potomac River cuts through the mountains. The Harpers Ferry gap, however, is commanded by Loudon Heights, Maryland Heights, and the high ground west of Harpers Ferry, and therefore was of little military significance. The only places where the armies of the sixties could cross the mountains were the wind gaps, eight of which influenced the campaign. From south to north, these are Manassas Gap, Ashbys Gap, and Snickers Gap in Virginia; Cramptons Gap and Turners Gap in Maryland; Fairfield (or Monterey) Gap near the Maryland-Pennsylvania State line; and Cashtown Gap and Carlisle Gap in Pennsylvania. Altitudes of these gaps range from 600 feet at Manassas Gap to 1,400 feet at Cashtown Gap. The Virginia and Maryland gaps are of erosional origin; Fairfield, Cashtown, and Carlisle Gaps in South Mountain were formed by a combination of faulting and erosion.

After it became apparent, on June 15, that the Union army was moving northward and not toward Richmond, Longstreet's and Hill's Corps of the Army of Virginia followed Ewell's Corps across the Blue Ridge into the Great Valley using the three Virginia gaps, and thence northward. Lee's concentration area, in and around Chambersburg, Pennsylvania, was reached between June 24 and June 28.

In the Gettysburg campaign area the Great Valley is from 10 to 20 miles wide and averages about 15 miles. It is underlain by limestone and shale, mostly of Ordovician age, and results from the incompetent nature of these formations as compared to the harder ridge-forming quartzites on either side. In Virginia and West Virginia the valley drains northward through the Shenandoah River into the Potomac. The divide north of the Potomac is a few miles north of Chambersburg, standing at an altitude of about 650 feet. From that area the Hagerstown Valley is drained by Conococheague Creek, which flows into the Potomac at Williamsport, Maryland. The Cumberland Valley drains northeastward into the Susquehanna at Harrisburg through Conodoguinet Creek.

The Great Valley was and is a fertile region, from which the Confederates, once across the Potomac, impressed a vast quantity of supplies of all kinds. Because of the gentle grades and deep soil the trafficability of the valley roads was good, and the Confederates reached Chambersburg in excellent condition.

Lee's selection of Chambersburg as a concentration point was based on the geology of Cashtown Gap. The other gaps in the northern part of South Mountain are narrow and tortuous; but Cashtown Gap, through which U. S. Highway 30 now runs, owes its existence and character to a great cross-fault, the Cashtown fault, which offsets the topographic crest of the main ridge of South Mountain about 3 miles. Erosion has carved in the fault zone an almost straight pass about

8 miles long, the highest point in which is a ridge less than a mile wide between the headwaters of Conococheague Creek on the west and Marsh Creek on the east. Of the eight passes that figure in the Gettysburg campaign, Cashtown Gap was the only one through which it was possible to move expeditiously a large force with artillery and wagon trains. By concentrating west of this gap Lee was able not only to protect his communications to the south, but to move either east or northeast over easy roads.

Lee held the initiative throughout his movement toward Gettysburg, and therefore movements of the Union army were dictated by those of the Confederates. The march across the Blue Ridge and into the Valley was so well screened by Stuart's cavalry that for a time Hooker had little idea of where the Confederate army was or where it was going. He did, however, move slowly northward in the Culpeper Basin, and on June 25 crossed the Potomac. He then moved up the valley of the Monocacy River to Frederick, sending three of his infantry corps to cover Cramptons and Turners gaps in South Mountain against a possible attack on Washington from that direction.

The exposed rocks in the Culpeper and Gettysburg basins are sandstone and shale that were deposited in Triassic time in the down-tilted western part of the Piedmont which abuts the Blue Ridge and South Mountain. In late Triassic time these sediments were intruded by sills and dikes of diabase. As the roads generally avoided the diabase outcrops, trafficability across the Triassic sediments was good, much like that in the Great Valley. Like the Confederates, the Union troops took advantage of geologic conditions to expedite their movements.

A critical day in the Gettysburg campaign, and possibly its turning point, was June 28. On that day two of Lee's three corps were concentrated in the Chambersburg area. Two divisions of the third corps, Ewell's, were at Carlisle, threatening Harrisburg from the west. The other division was at York, where it was in a good position to move toward either Harrisburg or Baltimore. From Lee's standpoint the campaign was progressing favorably except for one fatal lack: the usually dependable Stuart, instead of keeping his cavalry between the Confederate and Union armies, had started a raid toward Washington, east of the Federals and as far as Lee was concerned, was lost. Because of Stuart's unaccountable absence, it was not until the night of June 28 that Lee learned from a spy that the Union army had crossed the Potomac and was concentrated around Frederick. He therefore recalled Ewell's troops from Carlisle and York, and moved Hill's Corps through Cashtown Gap to Cashtown, to be in position to meet the Union threat.

General George G. Meade, commanding the V Corps, was awakened at 2 AM on that same June 28, and told that he had been named to succeed Hooker as Commander of the Army of the Potomac. Meade, assuming command under most disadvantageous circumstances, acted promptly. He recalled the three corps from Cramptons and Turners Gap, and sent cavalry through Turners Gap to ascertain the Confederate position around Chambersburg. Knowing that Confederate troops were at Carlisle and York, Meade moved his headquarters to Taneytown, and sent his engineers to select a strong defensive position, which later was to become known as the Pipe Creek line. He then sent three infantry corps, preceded by a strong cavalry screen, toward the town of Gettysburg, while the other four corps moved northeast and took position behind Pipe Creek. Both movements were made on the basis of the geology of the areas concerned.

The Gettysburg Basin, from its southern end near Frederick, widens northeastward toward the Susquehanna River; in southern Pennsylvania it is a wide, fairly level plain, except for the diabase outcrops. The town of Gettysburg, on this plain, was the hub from which radiated ten roads. Such was the road pattern that the Confederates, whether they came from Cashtown, Carlisle, or York, had no choice but to pass through Gettysburg. It was for that reason that Meade sent almost half his army toward that little town.

Meade, however, did not want to fight at Gettysburg, desiring a stronger position. The line which he selected, generally known as the Pipe Creek or Westminster line, might be better described as the Parrs Ridge line. Parrs Ridge, in the western edge of the Piedmont, extends northeast and southwest through Westminster. It forms the divide between the Monocacy River drainage on the west and the direct drainage to the Chesapeake Bay on the east. The ridge near the Pennsylvania-Maryland State line stands at more than 1000 feet above sea level, and at Westminster about 800 feet; this compares with the usual Piedmont elevations of 400 to 500 feet. Pipe Creek, flowing through the Triassic Basins north of the ridge and into the Monocacy River, is not particularly formidable, but Parr's Ridge,

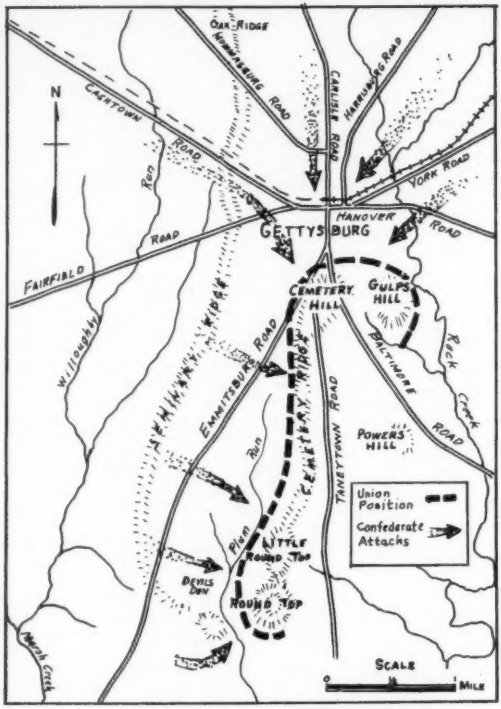


Figure 2. Sketch map of the Gettysburg battlefield.

to the east, upheld by highly resistant schists and quartzites, has not only height, but widths of 4 to 10 miles that could have been fortified into an almost impregnable defensive position.

Although Meade never used his Pipe Creek line, his choice shows his good eye for geology and topography. Circumstances beyond his control brought the two armies together at Gettysburg.

The Battle of Gettysburg
July 1 to 3

The Battle of Gettysburg was essentially an effort by the Confederates to drive the Union army from the outcrop of the Gettysburg sill south of the town of Gettysburg. This outcrop is shaped like a fishhook extending northward about 3 miles from Round Top through Little Round Top and Cemetery Ridge to Cemetery Hill, then east and south to the barb of the fishhook, Culps Hill. Round Top stands at 785 feet above sea level, Little Round Top at 650 feet. Between Little Round Top and Cemetery Hill, the ridge drops to about 570 feet. For comparison, the elevation of the town of Gettysburg is about 500 feet. Seminary Ridge, the Confederate position on the second and third days of the battle, stands throughout most of its extent at about 560 feet, but rises northward to 650 feet at Oak Ridge (see fig. 2). Seminary Ridge is the trace of a diabase dike that apparently is an offshoot of the westward-dipping Gettysburg sill.

One of the peculiarities of the Battle of Gettysburg is that the Northern armies moved to the battlefield from the south, the Southern armies from the north. The battle started, almost by accident and certainly against the wishes of both Lee and Meade, on the morning of July 1. General A. P. Hill, thinking the town was held only by militia, authorized two brigades to move into the town and obtain a supply of shoes reported to be there. The two brigades were speedily disillusioned; once across Willoughby Run they encountered dismounted cavalry and artillery, which they drove back about a mile. Then they met two infantry corps that had just reached the field and were themselves driven back. In the meantime, the remainder of Hill's Corps and all of Ewell's Corps were pouring into Gettysburg over the Cashtown, Carlisle, Harrisburg, and York roads (see fig. 2). During the afternoon these troops drove the outnumbered Federals through the town of Gettysburg and to the base of Cemetery and Culps Hills. Then occurred the first of a series of almost inexplicable Confederate blunders that marked the course of the battle. The Southerners were flushed with victory, the Union troops badly beaten, and enough of the long July daylight remained to storm the hills, which could not be protected by entrenchments because the diabase was practically at the surface. Yet Ewell, who up to that time had performed ably and even brilliantly as a Corps commander, made no move to attack, and the opportunity was lost. During the night the positions were reinforced so strongly that later efforts to take them failed.

Once the battle had started, the next phase was a race for the field by both armies. Of the Confederates, Longstreet's Corps, except Pickett's Division, reached Gettysburg early on July 2; Pickett arrived about 24 hours later. On the Union side, Meade moved all his infantry, except the VI Corps under General John Sedgwick, to the field by the morning of the 2nd; Sedgwick arrived late in the afternoon. Thus, on the second day of the battle the Federals outnumbered the Confederates, reversing the situation on the first day. Meade himself reached the field about 2 AM on the 2nd, after having sent General W. S. Hancock of the II Corps to

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The Future's Market

by ROBERT W. DECKER[1]

The most certain predictions are those a man keeps to himself and views in hindsight. But this is a little like playing the horses without betting, where mental winnings can be more frustrating than actual cash losses. Let's take courage and put the print on the line.

Having recently returned from a 2-month, 14,000-mile tour as an AAPG lecturer to both colleges and professional societies, I could quote all sorts of statistics about the enrollment and employment situation in earth sciences, particularly the petroleum industry. However, since excellent enrollment data was just reported in the May-June GEOTIMES, I would prefer to omit the statistics and give an over-all impression instead.

The depression in earth science enrollments is more severe than the depression in earth science professions. Some cut back in enrollments from the overcrowded classes of 4 years ago was a healthy trend, but the pendulum has swung much too far. It's true that many petroleum geologists, some of them good, experienced men, are now selling insurance or real estate. But I suspect this is partly their own choice because qualified men are still being hired for petroleum exploration, as well as for many other phases of earth science. One close acquaintance who served his armed services commitment after getting his master's degree in Geology, started job hunting last year. From 25 inquiries he finally received 7 firm employment offers and accepted a position in petroleum exploration in western United States.

Returning to predictions, the present situation will evolve as follows: A large percentage of seniors getting bachelor's degrees in Geology this year are in a favorable position to get stipends for graduate work. Since some graduate work is nearly a must for a career in earth science, most graduating seniors who seriously plan to enter the profession will be searching for graduate assistance. This year there should be enough stipends and graduate students to go around, with some lively competition by both schools and students for the best of each other. Next year, 1962-63, the situation will definitely turn into a buyer's market for earth science graduate students, with more graduate stipends available than qualified, new graduate students. The situation in 1963-64 is still vague, but the present trend may make it even a more severe discrepancy than in 1962-63. By that time increased opportunities in expanding research by both governmental and private agencies, particularly into areas of oceanography, geophysics and geochemistry, will be making an increasing demand for earth science students. The government's long range concern for natural resources and the public's increasing awareness that water and wilderness are not unlimited assets will also create new employment opportunities. If this is coupled with strong economic growth in the oil and mining industries, there will again be more employment interviewers on campus than prospective employees. The 10-year boom and bust cycle in earth science will have turned a full cycle and will still be nearly 180 degrees out of phase between enrollments and opportunities.

The pure academician may have little time for such tumult in the outer world, assuming as did early economic theorists that such cycles are inherent in a free society. Seismologists have not always been satisfied with undamped instruments, however, and neither should faculties accept large enrollment changes as inevitable annoyances. What can be done?

More predictions are necessary, not just impressions as in this report, but good statistical presentations of employment projections. The factors controlling the un-

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[1] Dr. Robert W. Decker, Department of Geology, Dartmouth College, Hanover, N. H.

Whither Geology and Geologists?

by B. Warren Beebe [1]

Whither geology and geologists? This was the paramount topic of an unusual feature of the recent annual meeting of the American Association of Petroleum Geologists in Denver. This feature was a symposium, a three hour panel discussion by six prominent, concerned geologists, held Monday morning, April 24, preceding the formal technical program. In a hall seating 300, there was standing room only during most of the discussion. The audience was composed of students, recent graduates, a few unemployed experienced geologists, but the largest percentage were well established geologists from industrial, academic, and state and government fields, and included many distinguished members. Perhaps the highlight of the entire symposium was the fact that there were so many who were there because of their deep and abiding concern for the science and profession to which they had devoted so much of their lives.

The panel consisted of Warren O. Thompson, Chairman of the Department of Geology, University of Colorado, Boulder, Colorado; Raymond D. Sloan, Denver area manager, Humble Oil & Refining Company, Denver, Colorado; Herbert V. Lee, staff geologist, Socony Mobil, New York City, identified with widespread foreign operations; George Gryc, U.S.G.S., Washington, D. C.; Orlo E. Childs, Director of Exploration Research, Phillips Petroleum Company, Denver, Colorado, and Chairman of the AAPG Committee for Industrial and Academic Relations; and moderated by B. W. Beebe, consultant, Boulder, Colorado, past Vice-President of AAPG, former Chairman of the Reorganization Committee of AGI, and currently Chairman of the Institute's Committee for Study of Professional Standards.

The discussions ran the gamut; past, present, future; academic training, employment, unemployment, opportunities, both exploited and unexploited, and concern of universities, professional organizations, geological surveys, and industry over the current plight of geology and geologists.

In the moderator's introduction, he defined the problem in its broadest terms, and expressed the concern of AGI over the present situation, telling of the various studies under way by several AGI committees, including the Education, and the Committee for Study of Professional Standards, representing geology in all its functions and specialties. This introduction was followed by discussions by each member of the panel of the current unhappy situation, and attempts to forecast the future in his particular field. The highlight of these discussions was the vividly illustrated portrayal and analysis of the great mass of information assembled by Dr. Child's committee. This information was compiled on large colored charts and graphs, easily followed by the audience.

The second hour of the symposium was devoted to questions, answers, and discussions among the panel members, developing points which could only be touched upon during the initial presentations.

Question Period

During the third and final hour, the meeting was opened to questions, comments, and discussion from the floor, with replies and comments from the members of the panel. The interest and concern of those present was clearly evident from the lively, pithy questions and comments from the floor. Only the moderator and the panel members were ready to call it quits at the end of the third hour!

Although no major problems were solved, there were many conclusions to be drawn, some of them fundamental in character. One of the most important is that for the first time in many years, many individuals of diverse interests are seriously concerned with the present and future of geology and geologists.

It was mutually agreed that there was little to be done to alleviate the present

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AWARD HIGHLIGHTS OF THE PETROLEUM GEOLOGISTS DENVER MEETING

situation. However, it was also pointed out that this is neither the first time geologists have found rough sledding, nor will it be the last. As an intelligent, well educated group, it is incumbent on geologists through our scientific and professional organizations to attempt to level out the tremendous peaks and troughs of supply and demand to which we are so vulnerable. No professional organization can or should attempt to guarantee employment or "job security" to every graduate or to those who find, then lose, employment. Such matters must be an individual responsibility.

Furthermore, it was generally agreed that four or even five years spent in gaining a bachelor's degree was not adequate for professional employment in geology, although characteristics and attainments of an individual play a very important role. Today, a master's degree at least appears necessary to prepare for a professional career in geology.

Of the 25,000 or more of us, samplings taken indicate that there are among experienced geologists from three to five percent unemployed, or available for employment. Approximately 1,000 individuals would welcome employment if offered under the *right* conditions and circumstances. Perhaps we are a little choosy!

Employment is proceeding on a highly selective basis, even though companies may be consolidating, weeding out, and laying off. One of the many sets of statistics which seems to have meaning is that few graduates with doctorates or master's degrees have trouble in obtaining positions. However, opportunities for graduates at the bachelor's level are limited. Most of the latter fortunate enough to find employment are employed at sub-professional levels. But this again is highly subjective and depends on the individual. Suffice to say that the recent graduate with a bachelor's degree, even with some experience, has tough sledding and lots of pavement pounding ahead. There can be no doubt that a man who excels as an undergraduate will be even better at the master or Ph.D. level.

Furthermore, there can be no argument that too many of our bachelor graduates

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Sidney Powers Memorial Award winner Clarence L. Moody is congratulated by AAPG President Ben H. Parker. Introduction of Mr. Moody was by Frank R. Clark (left) who substituted for Frank A. Morgan; N. Wood Bass and K. E. Lohman looking on.

Harold W. Owens (left) accepts the Matson Award Silver Cup from AAPG President Ben H. Parker for his presentation of his paper "Florida-Bahama Platform" at the 1960 AAPG meeting in Atlantic City.

Richard W. Fetzner (left) is congratulated by AAPG President Ben H. Parker upon winning the President's Award for the best paper by an author under 35 years of age published in 1960 in the AAPG Bulletin.

GEOLOGY FUTURE *Cont. from p. 15*

over the last fifteen years were more interested in salary, security, and geology as a "royal road to riches" than they were in geology as a science, or a way of life. And far too many of these graduates were inadequately trained to survive in this highly vulnerable, competitive field of geology. Although there are a few deserving unemployed, by and large, the past several years have tended to eliminate those to whom geology was an easy avenue. Admittedly, these observations are of small comfort to one who is a "statistic." But there is no doubt that the age-old law of the survival of the fittest has been in operation for the past few years as a result of wartime shortages with zooming demand during the post war decade. The great percentage of those falling by the wayside during this period of weeding out are from this group.

Academic Shortcomings

The subject of general academic preparation was thoroughly explored. There was general agreement that the average graduate at any level is too frequently lacking woefully in both ability in composition and oral expression, and in the broadening influences of the humanities, the oft scorned Liberal Arts. Too, more emphasis must be placed on basic sciences of physics, chemistry, mathematics, and biology. There is concern over how all of this training can be packed into a four year curriculum and yet have time for the necessary geological courses. There was some sentiment expressed for five years under-graduate training for a bachelor's degree. Others feel that perhaps the basic science and engineering courses should be tailored to their geological applications. The massive study of curricula and course content in the geological sciences, now commencing under the auspices of AGI, will be of great value in analyzing the many aspects of geological training.

One of the major and most serious problems which can be anticipated in the not too distant future, if enrollment of undergraduate geology majors continues its precipitate decline, is the danger that there will be no candidates for our graduate schools in the geological sciences. There must be an adequate, continuous, select group of candidates attracted to the geological sciences, with emphasis on quality rather than quantity.

Industry Criticized

Industry received its share of criticism for too often employing individuals whose qualifications were in doubt, and its ill advised recruiting practices. Too often many of us tend to overlook the fact that as profits go down and cost of finding oil goes up, and in face of surpluses, exploration is extremely, although too often shortsightedly, vulnerable.

The results of the initial studies of the AAPG Committee on Industrial and Academic Relations will be published in full at a later date. It appears that there will be decidedly less opportunity for employment in the petroleum industry for the next few years. Nor will opportunities for employment on university faculties or in state and federal surveys expand greatly.

However, there appear to be a number of fields which have not been fully exploited. These include municipal, state and federal agencies concerned with water supplies, highways, construction and other engineering projects where geologists can be most useful. Limited but unexploited opportunities exist in many industries, construction for example, not now using many geologists. There is a fertile field for well trained geological scientists as teachers of science in secondary schools.

Employment and security are, and will always be an individual responsibility. No professional organization of scientists can guarantee employment or tenure to its members. There is no place for the guild or closed shop in science. Nevertheless, geologists, through professional organizations, can and must attract the best qualified candidates, insist on the necessary adequate and rigorous training, develop and maintain high professional standards and pride in attainments as scientists rather than "job holders," exploit every conceivable opportunity for expanding the manifold uses of geology and talents of geologists, and continuously and energetically educate the public to the cultural and economic benefits of geology. These are the means by which our problems can be solved. The future of geology in our economic life and among the various scientific disciplines rests not on "Big Brother," unions, or appeals to the "State House," but squarely on geologists!

NATIONAL ASSOCIATION OF GEOLOGY TEACHERS

Second in a series of articles on the AGI Member Societies

by FRITIOF FRYXELL

The National Association of Geology Teachers was admitted to affiliation with the American Geological Institute on July 6, 1954. As Chester R. Longwell of Yale observed, NAGT thus became the "lucky thirteenth" among the member societies of AGI. He added in lofty vein, "We recall that our country began its proud career with the union of thirteen independent colonies which came to realize the advantages of standing together."

A vigorous organization, and a rapidly growing one, NAGT seeks, in the words of its constitution, "to foster improvement in the teaching of the earth sciences at all levels of formal and informal instruction, to emphasize the cultural significance of the earth sciences, and to disseminate knowledge in this field to the general public." This statement of purpose has guided the Association from its beginnings. It is a broad statement—broad enough to encompass geological instruction from the primary schools through the post-graduate training offered by colleges and universities, and hearty cooperation with such activities as those of the National Park Service, the Boy Scouts, and the proliferating clubs of amateur collectors.

Several other societies, much older than NAGT, are keenly interested in these objectives, and likewise promote them in various ways. However, NAGT is the only organization devoted primarily to geological education. It welcomes into membership any person genuinely interested in any phase of its work.

Fritiof M. Fryxell, the author, is Professor of Geology at Augustana College, Rock Island, Illinois. Dr. Fryxell was the first president of the Association and is a recipient of the Neil Miner Award.

HISTORICAL SKETCH

Kurt E. Lowe of the City College of New York termed the story of NAGT "the spread of a great idea." This idea was, in all simplicity, the conviction that persons closely identified with geological education would benefit greatly through association in ways providing for exchange of ideas and discussion of mutual problems. "Teachers are thoughtful folk," affirmed Longwell, "quick to realize the advantages of union."

The idea germinated quite spontaneously, on October 3, 1937, when five geology teachers chanced to meet for a few minutes at the close of the Fifth Tri-State Geological Field Conference, at Wauwatosa, Wisconsin. They were all from mid-western colleges, and were teachers in "one-man departments." As such, they had worked largely alone, and they agreed—unanimously and in all earnestness—that they needed to get better acquainted, under circumstances which would permit them to compare notes on their teaching and other common problems.

Accordingly, they did meet again, on May 13, 1938, at Augustana College, Rock Island, Illinois. Two more teachers were

Second Annual Meeting of the Association of College Geology Teachers, May 5-6, 1939, Cornell College, Mount Vernon, Iowa. Front row (left to right) Charles L. Bieber, North Central College; David M. Delo, Knox College; Fritiof Fryxell, Augustana College; Katherine F. Greacen, Milwaukee-Downer College; Neil A. Miner, Cornell College; Charles R. Keyes, State Archeologist of Iowa; Unidentified; Francis M. McClenahan, Monmouth College. Second row (left to right) Monta E. Wing, Beloit College; Edward L. Clark, Drury College; Percival Robertson, Principia College; Lincoln R. Thiesmeyer, Lawrence College; Leonard R. Wilson, Coe College.

present, and several visitors. Other teachers, invited to attend but unable to do so, wrote in, endorsing the suggestion that a permanent association be formed. Discussion of this proposal and other topics filled that day, and overflowed into the next. As a result, an "Association of College Geology Teachers" was formed. Officers were elected, and a committee was instructed to prepare a constitution.

The idea had rooted, but to begin with its growth was modest. However, the proponents of the idea were enthusiastic, and confident that it had merits which in time would win widespread support. At the 1939 meeting, held at Cornell College, Mount Vernon, Iowa, a constitution was adopted. Succeeding meetings were held at Beloit College, Beloit, Wisconsin, in 1940; at Lawrence College, Appleton, Wisconsin, in 1941; and at Principia College, Elsah, Illinois, in 1942. Teachers in other sections followed the mid-west experiment with interest; some encouraged it by "joining up," even though distance prevented them from attending the spring conclaves.

Meetings during the years 1938-1942 followed a general pattern which, being quite flexible, has served through later years. Each year the Association met for two days, in April or May. Friday was devoted to business and to a program including special papers, symposia, and informal discussion. There was an evening dinner, tendered by the college in honor of its guests, followed by greetings, talks —and more informal discussion. On Saturday a local field trip was conducted. Both days gave visiting teachers a chance to observe the teaching facilities of the host college. Events were made a matter of record in a mimeographed "Proceedings," which included both business transactions and papers (some in abstract).

Then came World War II. No annual meetings could be held because of travel restrictions and dispersal of members in war work. Nevertheless the Association was held together by its president, Percival Robertson of Principia College, who for more than three years kept the members and friends of the group in touch with each other by means of frequent news letters. A past-president, Lincoln Thiesmeyer, also did yeoman's service before being called from his academic post at Lawrence College. He completed, for the Association, compilation of a reference list of geological works useful for laymen and elementary students. This was published in the *Journal of Geology* for May-June, 1943. Separates were widely distributed, and their sale helped defray the costs of Robertson's news letters. Thiesmeyer also was the Association's delegate at a meeting held April 10, 1943, in Fort Worth, Texas, convened to consider Carey Croneis's historic proposal for an organization which would unite all geological societies in the country, and he served as chairman of the delegates of the six national societies represented. Purposes of the proposed federation were formulated, and the foundations were thus laid for the establishment of the American Geological Institute a few years later.

New Name Adopted

With peace restored, the Association resumed its annual meetings and other activities. The 1946 meeting, at Knox College, Galesburg, Illinois, was a particularly important one. In response to the increasingly warm interest manifested by university teachers and others in its work, the Association undertook to encourage membership on the part of all concerned in any way with geological education, and in line with this new emphasis adopted the more inclusive name, "Association of Geology Teachers." It also decided that it would undertake publication of a *Journal of Geological Education* as soon as practicable, to replace the mimeographed proceedings, transactions, and news letters.

The soundness of these decisions presently became evident. At the 1947 meeting, at Milwaukee-Downer College, Milwaukee, Wisconsin, and at the 1948 meeting, at Hanover College, Hanover, Indiana, college and university teachers participated together in the programs and business of the Association—a cordial relationship which has continued ever since. At the 1947 meeting, for the first time a university professor, Arthur Howland of Northwestern University, was elected president. The changed order was also evidenced by the fact that the 1949 and 1950 meetings were held at the University of Chicago and the University of Illinois respectively. Both meetings were distinguished by unusually large attendance and varied programs, as compared with earlier meetings.

At the 1949 meeting, a paper by Ben Hur Wilson of Joliet Junior College stimulated much discussion on a problem which has long concerned geologists, but for which no wholly satisfactory solution has yet been found, namely the place of geology in the high school curriculum. (The Association has a number of members who are engaged in teaching the earth sciences at the secondary school level.)

In 1948 the newly-organized American Geological Institute got off to a good start. The first Executive Director of AGI was David M. Delo, a founding member, past president, and leading spirit of the Association. It is not surprising that the initial program of the Institute, which took shape under Delo's capable direction, included a number of projects not unlike those on the agenda of the Association. These the Association gladly relinquished to AGI, inasmuch as through the sponsorship of the Institute they achieved the support of the entire profession, rather than only a segment of it. Since 1948, the Association has strongly supported AGI projects, through its individual members and officially as an organization. Undoubtedly the comprehensive program of AGI has had the effect of placing the Association in a much stronger position to emphasize its primary interest, namely geological educaton in the academic field.

Regional Meetings

Members early recognized that their association could function effectively on a national basis only through the establishment of subdivisions in different parts of the country. Discussions of this subject culminated at the Chicago meeting, in 1949, when a special committee was instructed to work out a practicable arrangement. This committee prepared a plan whereby the country might eventually be subdivided into ten regions, each with a section of the Association having its own officers and holding sectional meetings to supplement the annual national meetings. Boundaries of subdivisions were tentatively drawn so that members of a given section would all reside within distances of each other not greater than 500 miles.

Alert teachers in eastern institutions were the first to seize upon the opportunities thus opened up. On November 18, 1950, an Eastern Section was organized at Washington, D. C., during sessions of the Geological Society of America. In 1951, the parent organization met jointly with the newly-formed Eastern Section, at Detroit, again concurrently with GSA. Reorganization was effected, and the constitution modified to provide for a national body, comprising, at the outset, two regional subdivisions, a Central Section (with which most members of the parent organization presently affiliated themselves) and an Eastern Section, and providing for the future addition of other sections. The national organization was regarded as being primarily a coordinating and supervising agency. The purposes of the Association, it was thought, would be implemented largely through the activity of the members within the framework of the various sections.

The regional plan "caught on" in most encouraging manner, as evidenced by the establishment of sections as follows:

Eastern Section, organized at Washington, D. C., 1950.

Central Section, organized at Detroit, 1951.

New England Section, organized at Williams College, 1952.

East Central Section, organized at University of Cincinnati, 1953.

Far Western Section, organized at San Francisco State College, 1954.

Southeastern Section, organized at New Orleans, 1955.

Pacific Northwest Section, organized at Spokane, 1957.

Southwestern Section, organized at Tucson, 1959.

Texas Section, organized at Austin, 1959.

Plans are currently taking shape for the organization of the tenth and final subdivision of NAGT, a North-Central Section (including Montana, North Dakota, South Dakota, Nebraska, and Wyoming), under the leadership of Robert E. Stevenson of the State University of South Dakota. The outlook is bright for the early establishment of this section, which will complete the overall national plan for NAGT.

Like the 1951 meeting at Detroit, the national meetings of the Association have generally been held concurrently with GSA. The subsequent meetings were held at Boston (1952), Toronto (1953), New Orleans (1955), Minneapolis (1956), Atlantic City (1957), St. Louis (1958), Pittsburgh (1959), and Denver (1960). The 1954 national meeting was actually held on January 28-29, 1955, at Columbus, Ohio, jointly with the East Central Section. In 1959, the national group met twice, the second meeting being held at Columbus on December 4-5. The national meeting for 1961 is scheduled to be held with GSA at Cincinnati, in November.

National meetings are devoted to programs, including papers and address, and business matters such as reports of officers and committees, consideration of matters of policy, citations, and the announcement of the mail ballot count on the election of officers. The meeting with GSA at Pittsburgh, on November 4, 1959, took the form of a symposium on "Geologic Terminology."

Most sectional meetings have been held in the spring, and, as noted, have followed the plan of the early meetings of the parent organization, though with many variations. They have enabled the teachers of neighboring institutions of different types to meet in relatively small, informal groups, and thus get to know each other and their respective departments, to present and discuss papers, to conduct field trips, and in other ways to broaden their outlook and gain knowledge applicable to their work. The benefits to geological education resulting from these personal contacts, at gatherings held year after year on scores of college and university campuses across the land, cannot be measured but beyond doubt have been very great. Occasionally, joint sectional meetings have been held.

One can convey no better idea of the work of the Association than by listing some of the topics which have been considered, in symposia or special papers, at national and sectional meetings. Some of these topics are of perennial interest, and come up for discussion repeatedly. The following topics are representative: teaching objectives and methods in specific courses (e.g. Physical and Historical Geology, Mineralogy, Paleontology, and Summer Field Courses); preparing the college student for graduate school; geology courses for the non-major; the place of geology in primary and secondary education; popularizing geology; geology and TV; the research program of the geology teacher; visual aids; the cataloging and storing of specimens; the library, laboratory equipment, and museums of the geology department; the significance of foreign languages and literature in the study of geology. Plans have been worked out successfully for the exchange of duplicate specimens, slides, maps, and books between different institutions.

Journal of Geological Education

The decision to issue a publication devoted to the purposes of the Association was made as early as 1946, but the problems involved were not all overcome until five years later. In April, 1951, appeared the first issue of the *Journal of Geological Education*. Since then the Journal has been published semi-annually, with the issues dated in the spring and fall. Beginning with the spring issue of 1954, the Journal has appeared in an enlarged format. From 1951 through 1953, the Journal was edited by William F. Read of Lawrence College; from 1954 through 1956 by Anastasia Van Burkalow of Hunter College; from 1957 through 1958 by Mildred F. Marple of Ohio State University; and since 1959 by Robert L. Bates, also of Ohio State University.

The Journal has well fulfilled its purpose of providing a channel through which geology teachers could publish their ideas relating to the objectives, problems, and

techniques of geological education. In the twenty-two numbers issued to date, the Journal has included many papers presented at national and sectional meetings, as well as other special contributions. In its pages have appeared the transactions of the Association (including business of national and sectional meetings, and reports of officers and committees); book reviews; obituary notices and memorials; and presidential and other addresses. In each issue are listed the current national and sectional officers.

Symposia, which have always been popular with the Association, account for parts of issues, or whole issues. Noteworthy in this connection is a special issue of the Journal (Volume 4, Number 2, Part 2, issued in the fall of 1956) devoted to papers presented at the spring meeting of the Eastern Section, held at West Virginia University, Morgantown, West Virginia, on March 30, 1956. Twenty-five geologists participated in this symposium, which was tape-recorded and, later, stenographically transcribed. Publication of this issue was made possible by an anonymous gift to the Association.

Affiliations

In 1954, as previously noted, the Association became one of the member societies of AGI, an organization with which it has been historically linked and with which it shares many objectives. In 1955 the Association became an affiliate of AAAS. Recently (1960), after holding national meetings in conjunction with GSA for a decade, the Association became officially affiliated with that society.

The Association has had more than perfunctory ties with these organizations; it has participated with them in many ways in significant endeavors.

Growth

Step by step, the Association has made its impact on the geological profession more widely and deeply felt; its influence is now truly country-wide. This has come about through progressive measures such as broadening the membership base, adoption of regional organization, wide distribution of the *Journal of Geological Education*, and collaboration with other societies. The original membership in 1938 was 7; this had increased to 76 by 1948; to 191 by 1952; to 250 by 1953; to 417 by 1956; to 468 by 1958; and it is now (1961) approaching 700. In view of this healthy and accelerating growth, and, particularly, the formation of sections, throughout the country, it was deemed appropriate, at the 1958 national meeting, to make another change of name; the society became the "National Association of Geology Teachers."

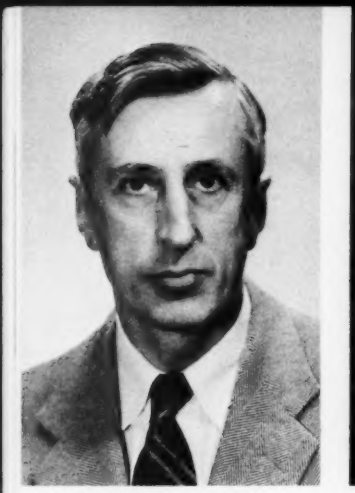
Neil Alden Miner (1898-1947), late Professor of Geology at Cornell College, Mount Vernon, Iowa. NAGT's annual award "for eminence in stimulating interest in the earth sciences" honors the memory of Dr. Miner.

Manifestly such growth could not have come about except through the dedicated efforts of many loyal members. To acknowledge the services of these individually is impossible. However, a grateful tribute is in order to several teachers who gave distinguished leadership to the Association during its formative years but whose labors were cut short by death: Neil A. Miner of Cornell College, president in 1939-1940; Carl Leland Horberg of the University of Chicago, president in 1953-1954; William H. Shideler of Miami University, president in 1954-1955; Stannard G. Bergquist of Michigan State University, president in 1955-1956; and Ralph E. Digman of Harpur College, president of the Eastern Section in 1950-1951 and national secretary in 1951-1953.

Awards

Honorary Members. These may be elected by the unanimous vote of the Executive Committee.

Neil A. Miner Award. At the national meeting at Boston, in 1952, the Association established an annual award to be given "for eminence in stimulating interest in the earth sciences." The award was named in honor of the late Neil A. Miner,



Charles D. Campbell
President

Wakefield Dort, Jr.
Treasurer

Dorothy J. Gore
Secretary

OFFICERS of NAGT

A. O. Woodford
Vice President

Robert L. Bates
Editor

a founding member of the Association. The recipient is selected by an award committee from nominations submitted by members of NAGT. He need not be a member of the Association nor engaged in formal teaching. The award has been presented at the national meeting each year since 1953.

Committees

The constitution, as amended on December 22, 1958, provides for the following permanent committees: an Executive Committee, a Policy Committee, a Curriculum and Standards Committee, and a Finance Committee. There are also committees on membership and on the Neil A. Miner Award, and occasional *ad hoc* committees, such as a Committee on Geologic Terminology.

The Policy Committee is a steering committee. Its members are selected from the membership at large, and are teachers with 20 or more years of experience. The committee has as its primary function the statement of the underlying philosophy of

the Association, and defining the scope and nature of its service to the profession. It is authorized to act as a hearing committee on matters involving the violation of professional ethics.

The Curriculum and Standards Committee includes representatives of each section. It makes a continuing study of geology offerings in colleges and universities, with a view to defining curricula which are compatible with the current and projected needs of industry, and which will prepare students adequately for graduate study. Implicit in its area of operation is the matter of accreditation. This involves close liaison with AGI and other agencies concerned with this problem. The committee must decide to what extent, if any, the registration and licensing of geologists and geophysicists should come under its purview. It takes the initiative in studies relating to curriculum and standards, and offers help in these areas for the benefit of the profession.

The Finance Committee is concerned with current and long-range financial policy. In the matter of current financing, it works closely with the Membership Committee.

Officers and Dues

The present national officers of NAGT are as follows:

President: Charles D. Campbell, Washington State University, Pullman, Washington.

Vice-President: Alfred O. Woodford, Pomona College, Claremont, California.

Secretary: Dorothy J. Gore, Principia College, Elsah, Illinois.

Treasurer: Wakefield Dort, Jr., University of Kansas, Lawrence, Kansas.

Editor: Robert L. Bates, Ohio State University, Columbus, Ohio.

National dues are $2.50, and include subscription to the *Journal of Geological Education*. The various sections determine their dues; these are nominal (e.g., fifty cents, or one dollar).

Inquiries concerning membership and other matters may be addressed to the national secretary, Miss Gore.

Future of NAGT

The Association has flourished because it has filled a very real need. Its program has served the profession in important ways in the past, and should do so in the future. The national and sectional meetings, for instance, provide forums at which geologists can appraise the changing educational requirements of a changing profession. For geological education is not static but dynamic; witness the many ways in which the undergraduate and graduate curricula of the present are different from those of 1938, the year in which the Association was founded. Important, too, is the fact that, each year, oldsters drop from the ranks of the teachers and newcomers take their place. The latter may need some indoctrination, to be sure, but they also should have opportunities to infuse stimulating new ideas into established practices. The functions which NAGT can render are, it would seem, continuous and never-ending.

Robert E. Boyer's most recent circular letter to his associates on the Membership Committee contains a lucid statement of several basic issues with which NAGT will have to concern itself. It was contributed by William W. Hambleton of the University of Kansas, and includes these searching questions: How do the recommendations of the Seaborg report affect the future of graduate education in geology? In view of the major movement into earth science studies of related disciplines such as chemistry and physics, what should be the posture and philosophy of both graduate and undergraduate geological education in the years ahead? How should geological education respond to the yo-yo requirements of the petroleum industry and should there be any effort to provide a stabilizing force in this situation?

NAGT is still a youthful society, not yet twenty-five years old. For all its rapid growth and present stature, potentialities for further development are still impressive. Robert R. Schrock of M. I. T., president in 1959, pointed out that the *Directory of Geoscience Departments* published by AGI lists almost 1600 teachers of geology in degree-granting departments alone, and he estimated that probably an equal number of graduate students held teaching assignments of some sort. Each member of this teaching force, numbering perhaps 2500 to 3000, is a potential member of NAGT. Besides, there are many individuals other than teachers who, under the membership rules, could qualify by reason of their interest "in disseminating geological information." The present Membership Committee, headed by Robert E. Boyer of the University of Texas, is an active and imaginative one, fully aware of its opportunities and taking measures to follow them up. The situation augurs well for the continued growth of NAGT considerably beyond its present membership.

(Continued on page 43)

INDUSTRIAL ASSOCIATES AID AGI EDUCATION EFFORTS

Educational activities form the keystone of the program of the American Geological Institute. Some of these activities are aimed toward developing a better understanding of the geological sciences and their importance in the total picture of our world on the part of our educated public. Other activities are aimed specifically toward promoting higher standards of academic training in order that the geological scientists of tomorrow will be better equipped to undertake the research and applied research demanded of them by public and private interests.

The AGI Industrial Associates are a group of 16 companies which are supporting the general activities particularly in the area of education through annual contributions ranging in amount depending on the size of the company. Industrial Associate support of AGI amounted to $11,550 in the fiscal year just completed.

The Industrial Associate program was started about 1954 through the efforts of E. A. Eckhardt, a former president of AGI. The number of participating companies was expanded in 1956-57 by Dr. Eckhardt assisted particularly by Frank Cameron and J. L. Gillson. The recent recession, coupled with the great curtailment of mining and petroleum exploration caused some companies to drop their membership in 1961, but an active program of revitalization of the Industrial Associate membership is under study by the AGI Finance Committee.

The Industrial Associates of AGI are listed below. Further information on the program may be obtained by writing AGI.

AGI INDUSTRIAL ASSOCIATES

Amerada Petroleum Corporation
American Potash and Chemical Company
Arabian American Oil Company
Creole Petroleum Corporation
Cyprus Mines Corporation
Gulf Oil Corporation
Kennecott Copper Corporation
Phelps Dodge Corporation
Phillips Petroleum Company
Shell Oil Company
Socony Mobil Oil Company
Sohio Petroleum Company
Standard Oil of California
Standard Oil (New Jersey)
Texas Gulf Producing Company
United States Steel Company
Paul Weir Company, Inc.
Anonymous Contributor

COMMITTEE OF 1000 ATTAINS MEMBERSHIP GOAL FOR 1961

It is with enthusiasm and sincere appreciation that AGI can announce that its Committee of 1000 for 1961 now has more than one thousand members. Listed on the adjacent page are 243 members, bringing the membership in the Committee of 1000 for AGI–1961 to 1093. A contribution received in mid-May from Dr. Paul C. Henshaw of the Homestake Mining Company, San Francisco, was number 1000.

The significance of the Committee of 1000 to the American Geological Institute goes far beyond the very important fact that individual contributions of $10 or more by its members constitute one of the largest elements of AGI's current financial support. To the Institute, which has fought an uphill battle for recognition within the profession throughout its history, it is important that geological scientists–youthful and mature, well-known and yet-to-be-recognized, from industry and ivy halls–have joined in support of AGI through the Committee of 1000. Beginning with the March issue, the growing list of members of the Committee attests the interest of these geological scientists in the Institute and its efforts on behalf of the geological sciences.

It was Dr. Robert Karpinski of the University of Illinois, Navy Pier, Chicago, who first conceived the idea of the Committee of 1000 and who started the ball rolling in the fall of 1958 by enrolling about fifteen charter members in the Committee of 1000 for AGI–1959. He visualized local geological societies soliciting widespread grass roots support for AGI and the Committee of 1000. Although the Committee has not developed in quite the way Bob Karpinski visualized, it has achieved its goal of 1000 members in its third year of existence. Last year there were more than 600 members.

With the reorganization of AGI, it has been hoped that an adequate level of individual support by all members of AGI Member Societies and through the channels of these Member Societies could provide adequate money to avoid further direct fund raising efforts by AGI. Some argue that the profession as a whole is not ready to support AGI. The record of the Committee of 1000 strongly suggests otherwise. Your name can be added to the Committee of 1000 for AGI–1961 through a contribution of $10 or more which will be used to good advantage in furthering the efforts of the Institute on behalf of geology.

Recent additions to the Committee of 1000 for AGI-1961*

Agatin T. Abbott
E. D. Ackerman
Allen F. Agnew
David Ainsworth
A. H. Alcorn
Richard J. Anderson
Laurence E. Andrews, Jr.
Ariz. State SGE Chapter
Ted Arnow
Vernon R. Baker
Julian D. Barksdale
Wm. M. Barret
Brian M. Barrow
Fred W. Bates
Olin G. Bell
William Charles Bell
Charles B. Belt, Jr.
Charles R. Bentley
W. C. Bernstein
Marland P. Billings
R. H. Bixby
L. V. Blade
Ed Bloesch
Harold Bloom
H. H. Bradfield
Charles C. Bradley
Ruth G. Browne
John L. Browning
A. F. Buddington
W. L. Burnham
E. H. Burtner
Robert H. Burton
Robert W. Bybee
John George Cabrera
Eugene Callaghan
Gaylord L. Campbell
Frank C. Canney
Albert V. Carozzi
Alfred J. Carsola
G. R. Carter
William Douglas Carter
R. Chadwick
Walter M. Chappell
Francis R. Clarkson
Ernest Cloos
Phil K. Cochran
Kirby Cockerham, Jr.
John R. Cooper
Margaret Cooper
Henry R. Cornwall
John Rowland Cox
Doris M. Curtis
T. W. Daniel, Jr.
James W. Danser
Ronald K. DeFord
Charles S. Denny
R. J. Dilger
Gordon E. Dixon (In memory of) **
Edward G. Dobrick
Ernest Dobrovolny
John Raymond Dooley
James R. Dorrance
Frank James Doyle
Avery A. Drake, Jr.
Ernest P. DuBois
James H. Dunaway
Carl E. Dutton
Homer M. Eagles
Shelby M. Eddington
George Ely
D. O. Emerson
Chester O. Ensign, Jr.
Eric K. Ericson
H. E. Eveland
Rizer Everett
Z. W. Falcone
Farmington Geological Society
Clyde R. Farquhar
James R. Fasbender
A. E. Fath
George H. Fentress
Willis H. Fenwick
Frank C. Foley
Jane L. Forsyth
Robert E. Fox
H. L. Franques
Samuel B. Frazier
F. M. Fryxell
D. L. Gardner
Jewell J. Glass
Hunter C. Goheen
Richard E. Grant
Lockhart R. Gray
Malcolm B. Greene
William Jeffries Greer
R. B. Grigsby
Arthur J. Gude, 3rd
Gerald H. Haddock
John C. Haff
Bruce M. Hall
Cornelius K. Ham
William E. Hanson
Frank W. Harrison, Jr.
Harvard Geology Club
Louis W. Hauschild
Allan W. Hazard
Jane K. Hearn
George C. Heikes
William J. Hendy
Paul C. Henshaw
Leonard F. Herzog, Jr.
C. F. Hewett
Louis Heyman
W. L. Hill
Charles E. Hunter
Henry R. Joesting
Frederic A. Johnson
R. F. Johnson
Walter H. Johnson
C. William Keighin
Stanton B. Keith
A. R. Kerr
Ross L. Kinnaman
J. M. Kirby
Montis R. Klepper
Harry J. Klepser
Jack W. Knight
Wilson M. Laird
Lee C. Lamar
Robert A. Laverty
Ralph W. Lawson
Beach Leighton
Richard W. Lewis, Jr.
Earl H. Linn
Vincent K. Litwinowicz
W. E. Long
S. A. Lynch
William Lytle
Perry S. McClure
W. D. McIntosh
Robert L. Maby, Jr.
Jed B. Maebius
Robert L. Marsh
Jack P. Martin
Paul E. Melancon
Mansfield Merriman
Norman C. Miller
Robert W. Morris
Willis P. Mould
Charles G. Mull
D. R. Mullineaux
Matthew P. Nackowski
Richard P. Nickelsen
Robert T. Novotny
Gordon B. Oakeshott
Rayburn D. Ocamb
Ogden Tweto
Margaret O. Oros
Lincoln R. Page
Louis Pakiser, Jr.
John M. Parker
Robert H. Paschall
S. H. Patterson
George N. Pipiringos
Lucian B. Platt
Straton C. Podaras
Jerome M. Pollack
F. W. Preston
M. Wm. Pullen
Augustin Pyre
James F. Ralstin
George Rapp, Jr.
Caspar Rappenecker
Robert G. Reeves
Jack W. Reinhart
Charles E. Revilla
Robert L. Rist
L. Ritsema
Robert B. Raup, Jr.
Joseph F. Rominger
Reuben James Ross, Jr.
George Rozanski
John C. Ruckmick
Robert Earl Sanem
Louis C. Sass
J. H. Sawyer
Paul A. Schafer
Stuart L. Schoff
Edward J. Schwing
O. A. Seager
Leonard Searles
Winton L. Seymour
Jack R. Sheehan
E. D. Sherman
William W. Shisler
Deane K. Smith
Kenneth T. Smith
A. J. Solari
Warren D. Sorrells
Eugene A. Stephenson
John C. Stewart
Paris B. Stockdale
Donald B. Stone
R. W. Stone
Harold H. Sullwold, Jr.
C. H. Summerson
Frederick M. Swain
Ruth D. Terzaghi
T. P. Thayer
Henry D. Thompson
William S. Ting
Jane Titcomb
Frank B. Tolman
Lloyd D. Traupe
L. E. Trout
A. C. Trowbridge
G. L. Vinson
Leon R. Volterre
Wallace L. Wade
Erik K. Waering
Hugh H. Waesche
Holly C. Wagner
Chan Waldron
Roberts M. Wallace
Bennie Walthall
John M. Ware
David H. Warren
Robert W. Webb
Edward J. Webber
John H. Weitz
S. P. Welles
J. O. Wheeler
O. C. Wheeler
John R. Williams
William O. Williams
Sheldon P. Wimpfen
H. A. Winkler
Virgil D. Winkler
John G. Woodward
Wooster College Geology Club
James C. Wright
Herbert Yoho

* Listed here are 243 names added to the Committee of 1000 since the last published list appearing in the May-June issue of GEOTIMES. Previous lists also appeared in March and April issues.

** GORDON E. DIXON, a graduate student at the University of Illinois lost his life in the course of field work on his thesis in Canada in the summer of 1960. A contribution was made in his memory by fellow graduate students at Illinois.

AGI Visiting Geological Scientists

Make more than one hundred visits during past academic year

The AGI Visiting Geological Scientist Program, made possible for the third consecutive year through a grant from the National Science Foundation, provided for 107 visits by a roster of 60 geological scientists to campuses of colleges and universities during the past academic year. The program is intended primarily as an aid to the smaller departments of geological sciences and has been administered under the guidance of the AGI Education Committee, C. J. Roy, Chairman. Larger departments offering the Ph.D. are aided in a similar manner by the AGI Visiting International Scientist Program, which, during the past year, brought 5 outstanding geological scientists of international reputation to the United States for 3-month lecture tours.

A new feature of the program was the schedule of visits by 15 geological scientists to 24 institutions which do not offer a bachelor's degree in geology but which, for the most part, have active programs for the training of elementary and secondary science teachers. Some of the geologists participating in this portion of the program have been actively engaged in various facets of science curriculum improvement efforts.

Three of these visitors participated in an experimental type of visitation program conceived by the American Institute of Biological Sciences in which scientists of various scientific disciplines visited the campuses of small schools to participate in a *Science and Life Week* with the aim of relating science to community life.

The visitors who participated in the special new phase of the AGI Visiting Geological Scientist Program primarily for the upgrading of educational training and cultural enrichment are as follows:

VISITING SCIENTISTS AND HOST INSTITUTIONS

NON-DEGREE DEPARTMENTS

John E. Allen
Whitman College
Oregon College of Education
Eastern Washington State College

James R. Beerbower
Bethany College
Bridgewater College

Frederick W. Cropp
Loras College
Parsons College

Carl E. Dutton
Wisconsin State College

Samuel P. Ellison
New Mexico State Univ.

Richard M. Foose
San Francisco State College

Donn S. Gorsline
Pensacola Junior College

John W. Harbaugh
Humboldt State College

Robert L. Heller
North Dakota State University
Winona State College

Keith M. Hussey
Greenville College
Blackburn College

John H. Moss
University of Louisville
Morehead State College

Gordon B. Oakeshott
California Western University

Jerome Pollack
State College (Indiana, Pa.)
Mansfield State College

Chalmer J. Roy
Northeastern University
State University of New York at Albany

John A. Wilson
East Texas State College

In the program for the smaller degree-granting departments 46 geological scientists participated and 83 departments were hosts to visitors. These visits, following the established pattern of previous years were 2 to 3 days in duration. The visit program was built around several formal lectures with ample time for informal discussion of geologic problems between the visitors and the staff and students. Some visitors participated in field trips and some gave public lectures. Of great value in many instances were the conferences between the visitors and college administrators. From all reports it would appear that the program is achieving in large measure

its aims to stimulate the advancement of geologic education and research. Participants in the visits to degree granting departments are listed as follows:

VISITING SCIENTISTS AND HOST INSTITUTIONS

DEGREE-GRANTING DEPARTMENTS

George W. Bain
Beloit College
University of Minnesota, Duluth

James R. Balsley
Gustavus Adolphus College
Michigan College of Mining & Technology

Charles C. Bates
Lafayette College

Thomas F. Bates
St. Lawrence University
University of Mississippi

W. Charles Bell
Duke University

Lewis M. Cline
Kansas State University
Sul Ross State College

Preston E. Cloud, Jr.
University of Notre Dame
South Dakota School of Mines

Byron N. Cooper
The University of Tulsa
Hardin-Simmons University

Robert S. Dietz
University of California, Davis

Carl E. Dutton
Southeast Missouri State College

Dan E. Feray
Western Washington College of Education
University of Puget Sound

Peter T. Flawn
San Jose State College
Mackay School of Mines, University of Nevada

Robert L. Folk
Bowling Green State University
Marietta College

Samuel S. Goldich
State University of South Dakota
Colorado State University

Richard P. Goldthwait
Portland State College
University of Alaska

Carlyle Gray
University of Southwestern Louisiana
University of Tennessee

B. F. Howell, Jr.
University of Kentucky

Earl Ingerson
Carleton College
University of Wichita

Richard H. Jahns
University of Georgia
North Carolina State

Sheldon Judson
The College of Wooster
Harpur College

George A. Kiersch
University of Massachusetts

W. C. Krumbein
Texas Christian University
Wayne State University

Wilson M. Laird
Southern State College

Kenneth K. Landes
Earlham College
Wisconsin State College

Morris M. Leighton
University of Maine
Tufts University

J. Hoover Mackin
San Diego State College
University of California, Riverside

Ralph W. Marsden
The American University
Birmingham-Southern College

Digby Johns McLaren
Baylor University
Cornell College

John B. Patton
Washington & Lee University
Muskingum College

Raymond E. Peck
Mississippi Southern College
University of South Carolina

Edwin Roedder
Syracuse University

Meyer Rubin
Macalester College
DePauw University

J. Frank Schairer
Brooklyn College
Boston College

LeRoy Scharon
Colgate University
Colby College

Francis P. Shepard
Colorado College
University of Idaho

Robert R. Shrock
Miami University
Oberlin College

Edmund M. Spieker
Middlebury College
State University of New York at Buffalo

Harris B. Stewart, Jr.
State University of New York at New Paltz
The University of Rochester

Joshua I. Tracey, Jr.
Wittenberg University
Antioch College
Ohio Wesleyan University

Tjeerd H. van Andel
Southern Methodist University

VISITING SCIENTISTS AND HOST INSTITUTIONS

DEGREE-GRANTING DEPARTMENTS

(Continued from page 27)

Matt S. Walton, Jr.
Kent State University
Southern Illinois University

Harold R. Wanless
University of Virginia
Dickinson College

Edward H. Wisser
Montana State College

Hatton S. Yoder, Jr.
Clemson College
Louisiana Polytechnic Institute

Rainer Zangerl
Brigham Young University
West Texas State College

James H. Zumberge
Hamilton College
University of New Hampshire

AMERICAN ACADEMY OF ARTS AND SCIENCES

Dr. Kirtley F. Mather, Professor Emeritus of Geology at Harvard University, recently concluded four years as president of the American Academy of Arts and Sciences.

Among one hundred new Fellows of the Academy named at the annual meeting were the following earth scientists:

James F. Gilbert, Geophysical Service, Inc., Dallas, Texas

W. D. Johnston, Jr., U. S. Geological Survey, Washington, D. C.

Edward N. Lorenz, Mass. Inst. Tech., Cambridge, Mass.

Among the honorary foreign members chosen were Patrick M. S. Blackett, London University, London, England; and Philip H. Keunen, Geologisch Instituut, Groningen, Netherlands.

As reported in previous issues of GEOTIMES, the American Academy of Arts and Sciences awards annually three prizes of $1000 for meritorious unpublished monographs. One of the awards is made in the area of the sciences. The Monograph Prizes have been established to encourage and assist the publication of significant manuscripts. Manuscripts to be entered in the award contest are due by October 2, 1961. More information may be obtained by writing the *Committee on Monograph Prizes, American Academy of Arts & Sciences, Little Hall 33, Harvard University, Cambridge 38, Mass.*

by
Robert L. Bates
Department of Geology, Ohio State University

Three widely separated institutions of learning have placed entries in the dignified-come-on sweepstakes. All academic ranks, from the high-school senior to the college president, are being wooed. Upsala College, in East Orange, N. J., has issued an illustrated 12-page leaflet for distribution to all the high schools in the state. Radiating the enthusiasm of J. S. Yolton and his colleagues, the leaflet suggests that its title, *Geology Thrives at Upsala,* is not mere press-agentry. . . . "Please write to us—we want to be of help" is the invitation extended by Baylor University's geology department. This plea, which appears in a 27-page booklet entitled *Why Teach Geology,* is addressed to those colleges that don't have geology courses but might be talked into starting them. The booklet not only describes the courses necessary for a geology major, but gives information as to administrative and instructional costs. The point is made that geology is the least expensive of the sciences to equip, as Mother Nature supplies much of the laboratory and raw material. . . . From the University of Alaska comes a one-page illustrated appeal to the high-school graduate, suggesting that he consider the earth sciences as a career. Sponsored by the Alaska section of the AIME, the sheet naturally bears down on the glories of engineering, but geology gets a play too. . . . Gates Willard, who teaches science at the junior high school in Manhasset, N. Y., writes in the April issue of *The Science Teacher* on "The Importance of Earth Science in the Curriculum." (Unlike the Alaskans, Willard uses the term earth science in the conventional geology-astronomy-meteorology sense.) He presents a number of reasons why e.s. is preferable to general science, and he cites the large and growing e.s. programs in the schools of New York and Pennsylvania. . . . Through the Library of Science, a scientific book club, you can now buy a set of 15 fossil specimens plus a 64-page manual that tells you all about rocks, fossils, collecting, classification, and establishing Your Fossil Museum. No muss, no fuss, no bother. What will they think of next, for $7.95 (member's price $5.95)?

INTERNATIONAL UNION OF GEOLOGICAL SCIENCES FORMED

Geologists of 32 nations of the world joined to create the new International Union of Geological Sciences at a meeting held in Paris, March 9-10. Dr. J. M. Harrison, Director of the Geological Survey of Canada was named the first president of the Union.

The objectives of the Union are to promote and encourage the study of geological problems, to facilitate international cooperation in geology and related sciences and to assist the International Geological Congresses generally held every four years.

The officers of the new Union are:

President: J. M. HARRISON, Canada

Vice Presidents:

J. J. GORSKY, U.S.S.R.
L. HAWKES, U.K.
T. KOBAYASHI, Japan
J. LOMBARD, France
A. R. LAMEGO, Brazil
B. C. ROY, India

General Secretary:

THEO. SORGENFREI, Denmark

Treasurer: J. DONS, Norway

Details of operations, relations with the International Geological Congresses and problems of financing remain to be worked out. The new Union is being considered for membership in ICSU, International Council of Scientific Unions, a UNESCO organization. More details on the new Union will be published in GEOTIMES as they become available.

The formation of the International Union of Geological Sciences culminated much debate on the part of geologists of the world over a number of years. It was discussed in 1948 in London. At the XIX International Geological Congress in Algiers in 1952 there was spirited debate of the union issue and the consensus of opinion at the time opposed the union. Prior to the XXI Congress in Copenhagen last year, Dutch, Swiss and British geologists formally proposed that the union be seriously considered by the Council of the Congress (GEOTIMES, *May-June 1960*). The Council approved and established a committee to draft the statutes for the new Union. Final recommendations were approved by this committee at a meeting in Stockholm during the Christmas holidays, and at the March meetings in Paris, a number of sufficient countries had approved the statutes to permit the new organization to be formally launched.

J. M. Harrison, Director of the Geological Survey of Canada, recently was elected the first president of the newly-organized International Union of Geological Sciences.

Adherence to the new International Union of Geological Sciences by the United States will, through the U. S. National Committee, operate under the joint aegis of the National Academy of Sciences and the U. S. Department of the Interior. The first U. S. National Committee consists of the following persons:

U. S. NATIONAL COMMITTEE

Ian Campbell	M. King Hubbert
Kenneth E. Caster	T. B. Nolan
James Gilluly	E. F. Osborn
Hollis D. Hedberg	B. H. Parker
Mason L. Hill	P. J. Shenon

Harry H. Hess, *Chairman*
W. D. Johnston, Jr., *Secretary*

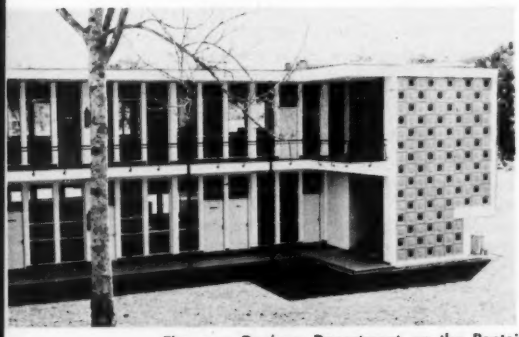
At an organizational meeting of the U. S. National Committee in Washington on May 6, Dr. Hess was elected chairman and Dr. Johnston secretary.

The objective of the U. S. National Committee is that its membership will be as representative as possible of the science and the profession as a whole and be responsive to collective desires. The U. S. National Committee will be the channel of communication between American geologists and the International Union of Geological Sciences.

UNIVERSITY OF MALAYA GEOLOGY DEPARTMENT

a report by
C. S. Hutchison

The old Geology Department on the Bukit Timah Road Campus, Singapore, 1957-1960.



The new Geology Department on the Pantai Valley Campus, Kuala Lumpur, 1960.

In the year 1956, geology was offered for the first time to science students in the University of Malaya. At that time there was only one University campus in Singapore City hidden amongst the trees on the west side of the main Bukit Timah road. The University of Malaya was known in pre-war days as Raffles College, the buildings of which were occupied and used by the Japanese (as their army headquarters) during the invasion and period of occupation of Singapore. The staff was interned in Changi prison for the duration of the occupation. The University of Malaya, as such, was established on the 8th October 1949 to serve the needs of both Singapore island and the Federation of Malaya.

The geology department was started in a very modest manner, being housed in a section of the main University buildings and taking up to a maximum of fourteen first year students. Very soon after its initiation it was moved to a separate building which was in fact only a re-converted staff house. Here the department had its existence and attained reasonable maturity from early 1957 to March 1960. During that period the academic staff grew to a total of four, but the student number was of necessity limited to fourteen in the first year, because of the size of the building.

A need was felt in the area for two University campuses and legislation came into effect in January 1959 providing for two largely autonomous divisions of the University of Malaya of equal status; the existing one in Singapore and a new one in Kuala Lumpur, the capital of the Federation of Malaya.

To give the new division of the University an initial momentum, it was agreed that certain departments should be completely transferred from Singapore to the new University in Kuala Lumpur. So it was that in April 1960, the complete department was moved 250 miles north by road and re-housed in the new science faculty buildings at Pantai Valley, about 3 miles from Kuala Lumpur. Teaching began in the new department at the beginning of the 1960-61 session with an admission of over 60 first year students, a considerable increase over the number formerly handled in Singapore.

Public Education is geology's best public relations tool

The new buildings provide two lecture rooms, a large well-equipped museum, an air-conditioned microscope laboratory, a chemical laboratory, reading room, rock preparation and sectioning room, garage, photographic darkroom and several air-conditioned staff rooms. Another large microscope laboratory and two further staff rooms will be provided in next year's extension plan.

The department is presently offering a normal type course in geology with emphasis on petrology and determinative mineralogy. Paleontology is given at subsidiary level for the reason that fossil localities are sparse in Malaya and the usual state of preservation is poor. To meet local needs, the course will be extended this coming year to include polished-section ore study. Polishing equipment and reflecting microscopes have been ordered from Germany. It is hoped that the department can extend its mineralogy section within the coming year by the addition of X-Ray diffraction and spectrographic equipment. In 1961, thermoluminiscence apparatus will be assembled to study the problems of limestone stratigraphy in Malaya.

By a generous gift from the Canadian Government, a comprehensive departmental library was recently added, complete with annual subscriptions to the major geological periodicals.

Provision has now been made for a fifth member of the teaching staff in January 1961 and building extensions may be allowed from time to time under the active scheme of expansion which the new University is pursuing. By 1962, the Kuala Lumpur Division of the University will be completely autonomous and be constituted as a separate University. It is as yet undecided which of the two Universities will retain the name of the Parent Body. Since the State of Singapore is no longer politically connected with Malaya, it seems logical that the University in Singapore will have to concede its original name to the University in Kuala Lumpur.

Whatever name it has to work under, the geology department has a secure future role to supply honor graduates to staff the Geological Survey of Malaya and the exploration sections of the numerous mining companies. Since the economy of Malaya is largely based on its cassiterite and hematite deposits, the future of the department is assured. Although yet in its infancy, the geology department of the University of Malaya can look forward to a bright future. This it can do with the assurance it will undoubtedly be one of the best-housed and best-equipped departments in Asia.

Stanford Names Visiting Committee

The School of Mineral Sciences at Stanford University invited sixteen outstanding geologists and industrial leaders to serve on its first visiting committee. The Mineral Science Committee met on the campus on May 12 to act as an informed and friendly observer and critic to lend the benefit of the members' experience and counsel in aiding the school in the pursuit of its educational and research objectives. The committee will be a continuing group and currently consists of Kenneth H. Crandall, *Chairman*, Vice President, Standard Oil Co. of California; Robert M. Hardy, Jr., President, Sunshine Mining Company; J. W. Hoover, President, Chevron Oil Company; Jack How, President, Western Machinery Company; Joe B. Hudson, Vice President, Monterey Oil Company; Virgil Kauffman, President, Aero Service Corporation; Earl M. Kipp, Special Consultant on Production, Standard Oil Company of California; Henry N. Kuechler, Jr., President, Knob Hill Mines Inc.; Thomas B. Nolan, Director, U. S. Geological Survey; Robert F. Playter, Executive Vice President, Gold Fields Mining and Industrial Ltd.; Philip J. Shenon, Consulting Geologist; Ward C. Smith, U. S. Geological Survey, California; H. Gardiner Symonds, Chairman of the Board, Tennessee Gas and Transmission Company; Raymond W. Todd, Vice President for Operations, Pacific Lighting Gas Supply Company; William J. Travers, Vice President, Richfield Oil Corporation; Donald E. White, U. S. Geological Survey, California.

Geologic Research Supported By Petroleum Research Fund

The Petroleum Research Fund of the American Chemical Society is currently supporting eight geologically-oriented research projects as follows:

NAME & INSTITUTION	SUBJECT
William J. Morris, Occidental College	*Conditions of Marine Pleistocene Deposits*
D. M. Scotford, Miami Univ. (Ohio)	*Mineralogical Study of Shale*
S. H. Ward, Univ. of Calif. Berkeley	*Electrical Polarization in Rocks*
Fred A. Donath, Columbia Univ.	*Anisotropy and Failure in Rocks*
Elso S. Barghoorn, Harvard Univ.	*Lake Bottom Sediments*
J. R. Vallentyne, Cornell Univ.	*Sediment Bands in Cayuga Lake*
Manual N. Bass, Calif. Inst. of Tech.	*Precambrian Rocks of Central U. S.*
Robert F. Schmalz, Penn State Univ.	*Carbonate Deposition*

Students from Brazil, Italy, Japan, Thailand, Venezuela, France, China, Spain, Pakistan, Germany, Israel, Belgium, Denmark and the U. S., discuss geology at the site of the Oak Ridge Experimental Gas Cooled Reactor.

Photo by Oak Ridge National Laboratory

Penn State Offers Electron Microscope Course

Pennsylvania State University will offer a two-week course in Electron Microscopy in its School of Mineral Sciences, September 4-15, 1961. The program will deal with basic electron optics, operation of instruments, preparation techniques and interpretation. Guest lecturers from industry will assist in presentation of the course. The registration fee will be $325. Additional information may be obtained by writing *School of Mineral Industries, Pennsylvania State Univ., University Park, Pa.*

Vertebrate Paleo Addition To Los Angeles Museum

The Los Angeles County Museum has recently received funds to permit the construction of a new vertebrate paleontology wing which will include a fossil research center and preparation laboratory. An appropriation of $72,960 by the Los Angeles County Board of Supervisors was augmented by a grant of $130,000 from the National Science Foundation to provide for the museum addition. The curator of vertebrate paleontology is Dr. Theodore Downs.

Public Education is geology's best public relations tool

GEOLOGY AND NUCLEAR POWER

It may be of interest to geologists that a short course in geology is a part of the curriculum of the Oak Ridge School of Reactor Technology. The school itself is unusual enough to require explanation. Shortly after the war, in 1947, the Oak Ridge National Laboratory gave a one-year course in nuclear engineering to a small group, several members of which are now leaders in the nation's reactor enterprises. Within a year or two, the demand for nuclear engineers had grown so critical that the Division of Reactor Development of the AEC requested ORNL to start a small specialized school. The first class was admitted in March of 1950, and new classes, some as large as 100, have followed at roughly one-year intervals. The training of nuclear engineers in this country has since shifted in part to the universities and the demand has fallen off, but a few years ago the Division of International Affairs of the AEC made the school available to foreign students and a majority of the nations friendly to us have taken advantage of the opportunity.

At present, two one-year courses are given, Reactor Operations and Reactor Hazards, although many of the classes, including the geology, are taken by both groups. The students must have at least a B.S. in some field of engineering, or in physics or chemistry, most have had some graduate study, and all are on somebody's payroll, the AEC's, that of some firm working on nuclear power production, or of some foreign firm or country. The average age is in the early thirties. Most of the class work is mathematical and theoretical, but there are also long hours spent in the laboratory and in actual reactor design and operation. It is a long, hard year but the graduates have always been in great demand.

Site evaluation is an important part of the Hazards course, and meteorology and geology are, in turn, parts of the problem of site evaluation. The meteorologists have by now developed quantitative methods for predicting the distribution by the wind of radioactive gases or aerosols which are released routinely or by accident from a nuclear power reactor. The relevance of

Submitted by the Oak Ridge National Laboratory, Operated by Union Carbide Corporation for the U. S. Atomic Energy Commission.

geology is more complex. As taught by Wallace de Laguna, for some years a member of the Ground Water Branch of the USGS and now on the ORNL research staff, the eight-week course attempts to cover two general classes of problems: how the geology and hydrology of the site influence the reactor, and how the reactor might affect the surrounding area. In the first group is the relation of geology to foundation design, earthquake hazards, and, since most large power reactors are built near bodies of water for condenser cooling, flood control. In the second group is a study of the mechanisms by which radioactive materials might be spread through the environment. Most of the fission products are strongly adsorbed by the clay minerals and if accidentally released on to the land surface would in large measure be held in the top inch or two of soil. This raises the possible need of preventing soil erosion in the general area around the reactor against the possibility that a reactor accident might contaminate the soil, and soil erosion involves the relation of the soil, plant cover and precipitation. Radioactive materials reaching a river or the sea will largely move with the sediments, and so their dispersion depends on geologic factors. Radioactive waste disposal, a principal problem at reactor fuel reprocessing plants, clearly involves geology as methods for ultimate disposal now under active investigation include the use of salt mines, hydrofracturing in shale, or, for very large volumes of very slightly contaminated water, their injection into deep porous formations now saturated with ancient connate brines. Quantitative ground water hydrology is an important part of the course, for the possible contamination of ground-water supplies has long been a recognized danger. In short, site evaluation requires a most detailed study of the site, and the course covers briefly most of the topics in physical geology. No attempt is made to turn out engineering geologists in 24 hours of lecture, but, perhaps, the students can be made aware of the role of geology in this new and challenging industry. Those of our profession who teach at engineering schools might well consider including some relevant material in their courses; if so, there is much of interest in technical papers in the Proceedings of the two Geneva "Atoms for Peace" conferences, in various government reports and in the reports of the waste disposal groups at Hanford, Oak Ridge and at some of the other AEC research centers. A soon-to-be-published GSA review volume on engineering geology will have a chapter on radioactive waste disposal.

Arrangements could be made for a college teacher of engineering, physics, chemistry or geology, to take the one-year course at the school with the AEC paying all expenses including salary, and much the same could be done for a geologist employed by one of the state or federal agencies. There are also opportunities for sponsored research in geology as a Summer Participant at several of the National Laboratories. Few would be chosen, but so far there have been even fewer applicants. Problems suggested for study would have to be relevant to the needs of the nuclear power industry but these are more varied that many geologist apparently appreciate.

Venezuelan Congress Reports Available

The Third Geological Congress of Venezuela was held in November 1959 in Caracas, capital of Venezuela, with excursions to interesting areas of the country before and after the congress. Sixty-seven lectures were presented on topics related to geology, stratigraphy, tectonics, sedimentation and applied geology, many of them of more than local interest.

The excursions were all very well chosen and the following areas were visited: the iron ore mountain Cerro Bolivar, part of the northern Guayana Shield, the Eastern Venezuela Oilfields, the turnpike between La Guaira and Caracas, the Perijã mountains and the Andes of Tãchira and Lara.

The results of this congress are being published in a memoir consisting of four well illustrated volumes of which I and II are already available.

Volumes III and IV will be published in July and August of this year. The volumes are being distributed free of charge to the registered delegates in Venezuela and abroad. Further copies may be obtained at a price of Bs 15 (at the official rate of exchange of 3.35). Checks should be made out in favor of: Dirección de Geología, Ministerio de Minas e Hidrocarburos. For further information please write to: *Congreso Geológico Venezolano, Ministerio de Minas e Hidrocarburos, Torre Norte, Piso 19, Centro Simón Bolívar, Caracas, Venezuela.*

Wilbur Stout Dies

Dr. Wilber E. Stout, former state geologist of Ohio died on May 20, 1961, at the age of 84.

MANPOWER *in a column —*

By HOWARD A. MEYERHOFF
Scientific Manpower Commission
1507 M Street, N.W., Washington 5, D. C.

The drastic drop in undergraduate majors in geology initially considered a salutory correction to the current employment situation in the earth sciences, has reached —and possibly passed—an exceedingly critical stage.

In the colleges and universities, it threatens the integrity of departments. Deans and college presidents are ever conscious of the ratio between students and instructors, and already some of them don't like what they see in their geology departments. To the extent that retrenchment might liquidate weak instruction and flimsy majors in the field, it may at first blush seem good. On the other hand, it will not be good if it deprives any substantial segment of our growing college population of exposure to earth science.

We can merely hope that one letter in the Commission's file is atypical. It is from a department head who laments the decimation of geology majors but who views with even greater alarm the recourse of offering cultural courses in the subject to bolster enrollments among non-majoring students.

This should be one of the functions of any department, whether times are lush or lean. Teaching the general student about the earth on which he lives calls for no relaxation of academic standards. It does, however, require that the instruction be lucid, interesting, and purposeful. Its ultimate result—literacy in earth science in an expanding and influential public—may pay off far more handsomely than the training of run-of-the-mill majors.

A more serious, long-range effect of the current dearth of majors is beginning to worry thoughtful department heads. The potential supply of geologists has already shrunk in undergraduate departments to the point where scholarships and assistantships go begging and departmental work is not being done.

The shrinkage can readily be projected into the graduate schools and beyond—into the work-a-day world of normal demand. The surpluses of 1959, 1960 and 1961 will be absorbed or dissolved, with some tragic casualties but with some cleansing of the dross with which the profession became encrusted during the fifties.

The time has come to end the talk of surpluses. The next item on the professions agenda is the question—will it be prepared quantitatively and qualitatively for the shortage of personnel in 1969, 1970, and 1971?

MIT TO OFFER EARTH SCIENCE DEGREE

Starting in June 1961, M.I.T. will begin to award the degree Bachelor of Science in the Earth Sciences on completion of an undergraduate program that emphasizes thorough preparation in mathematics, physics, chemistry and certain engineering subjects. The curriculum also includes subjects in the geosciences (geochemistry, geology and geophysics), meteorology, and oceanography, but is primarily concerned with preparing students for graduate work. Summer field work in one of the earth sciences will continue to be a requirement for graduation. The degree Bachelor of Science in Geology and Geophysics will be discontinued. This change in curriculum and degrees has been made because of the feeling that it is no longer possible to train a student adequately for future professional work in an earth science in a normal four-year undergraduate program.

New curricula have also been organized that will lead to the S.M. and Ph.D. degrees in Oceanography, with the program of instruction and research under the supervision of a Graduate Committee on Oceanography. This Committee includes staff members from M.I.T.'s Departments of Geology and Geophysics and of Meteorology, and certain senior scientists from the Woods Hole Oceanographic Institution who also hold part-time appointments on the M.I.T. Faculty. Thesis research will be conducted at M.I.T. and, by special arrangements, at Woods Hole and other oceanographic institutions.

Preston Cloud Elected To National Academy

Preston E. Cloud, Jr. was elected to membership in the National Academy of Sciences at the annual meeting of the Academy in April. Dr. Cloud, until recently chief of the Paleontology and Stratigraphy Branch, U. S. Geological Survey, is going to the University of Minnesota as Chairman of the Department of Geology to succeed George A. Thiel who recently retired.

SYNOPTIC CHART OF COMMON ROCK-FORMING SILICATES – PART I

AGI 26

by

Kurt Servos

Stanford University

NOTES: THE SCHEME OF TABULATION FOLLOWS THE MODEL:

GROUP	NAME FORMULA CRYSTAL SYSTEM, CLASS	COMMON FORMS CLEAVAGE TWIN. HARDNESS SP. GR.	COLOR STREAK LUSTER	HABIT	TESTS OR DIAGNOSTIC FEATURES	SIMILAR SPECIES, ISOTYPES, ISOMORPHISM	PARAGENESIS, OCCURRENCE, ASSOCIATION, ALTERATION

1. COMMON FORMS ARE LISTED ONLY WHEN ESPECIALLY USEFUL IN DIAGNOSIS.
2. CLEAVAGE SPECIFIES DIRECTION AND EASE OF PERFECTION. THE EASE IS SYMBOLIZED AS: A, PERFECT; B, EXCELLENT; C, GOOD OR EASY; D, POOR; E, INDISTINCT; F, IMPERFECT.
3. TWINNING IS INDICATED ONLY WHEN ESPECIALLY COMMON OR DIAGNOSTIC.
4. HARDNESS IS GIVEN ± 1/2 UNIT ON THE MOHS SCALE.
5. SPECIFIC GRAVITY IS GIVEN AS A MEAN VALUE AND MAY DIFFER EXTENSIVELY, DEPENDING ON VARIATION IN COMPOSITION.
6. ONLY THE MOST COMMON COLORS ARE LISTED.
7. FOR MORE PRECISE AND ELABORATE DESCRIPTIONS A GOOD REFERENCE SHOULD BE CONSULTED. BOOKS USEFUL IN THIS COMPILATION WERE: DANA, E.S., 1892, THE SYSTEM OF MINERALOGY: JOHN WILEY & SONS, INC., NEW YORK, 1134 p. BERRY, L. G. AND MASON, BRIAN, 1959, MINERALOGY: W. H. FREEMAN & CO., SAN FRANCISCO, 612p. HURLBUT, C. S., JR., 1959, DANA'S MANUAL OF MINERALOGY, 17th ED.: JOHN WILEY & SONS, INC., NEW YORK, 609 p.

SOROSILICATES

	LAWSONITE $Ca\cdot Al_2Si_2O_7(OH)_2\cdot H_2O$ ORTHORHOMBIC, 222	(110), (001) A, (110) D 6 3.09	WHITE, PALE BLUE, PALE GRAY, COLORLESS WHITE VITREOUS TO GREASY	PRISMATIC CRYSTALS, MASSIVE, GRANULAR	FUSES TO GLASS. WATER IN CLOSED TUBE.		ASSOCIATED WITH GLAUCOPHANE IN GLAUCOPHANE SCHISTS.
	HEMIMORPHITE $Zn_4Si_2O_7(OH)_2\cdot H_2O$ ORTHORHOMBIC, mm2	(100) A 5 3.45	WHITE WHITE VITREOUS	CRYSTALS TABULAR TO (010). COMMONLY MASSES, MAMILLARY, STALACTITIC, GRANULAR, MASSIVE.	STRONGLY PYROELECTRIC AND PIEZOELECTRIC. SOLUBLE IN HCl, GIVING GELATINOUS SILICA. DECREPITATES IN CLOSED TUBE.	PREHNITE HAS LOWER SPEC. GRAV., DISTINGUISHED FROM SMITHSONITE BY CRYSTAL AGGREGATES.	SECONDARY IN OXIDIZED ZONE OF ZINC DEPOSITS. ASSOCIATED WITH SMITHSONITE, SPHALERITE, CERUSSITE, ANGLESITE, AND GALENA.
	IDOCRASE $Ca_{19}(Mg,Fe)_3Al_4(Si_2O_7)_2(SiO_4)_5(OH)_4$ TETRAGONAL, 4/m 2/m 2/m	(110), (100), (111), (001) (110) D 6½ 3.48	GREEN OR BROWN, YELLOW, RED WHITE VITREOUS TO RESINOUS	PRISMATIC CRYSTALS, COLUMNAR AGGREGATES, MASSIVE, GRANULAR, COMPACT.	FUSES EASILY BEFORE BLOWPIPE FLAME (~ 1050°C). WATER IN CLOSED TUBE.	DISTINGUISHED FROM GARNET BY READY FUSIBILITY AND INTUMESCENCE.	IN CONTACT-METAMORPHOSED IMPURE LIMESTONES, WITH CALCITE, LIME GARNET, WOLLASTONITE, DIOPSIDE, TOURMALINE.
EPIDOTE GROUP	ZOISITE $Ca_2Al_3O(SiO_4)(Si_2O_7)(OH)$ ORTHORHOMBIC, 2/m 2/m 2/m	(001) A 6½ 3.30	GRAY, PINK, OR APPLE GREEN WHITE VITREOUS, PEARLY ON (001)	LONG PRISMATIC CRYSTALS ELONGATED AND STRIATED ‖ b, MASSIVE, COLUMNAR, COMPACT.	RESEMBLES SOME AMPHIBOLES BUT THE SINGLE PERFECT CLEAVAGE IS DISTINCTIVE.	DIMORPHOUS WITH CLINOZOISITE. PINK VARIETY IS THULITE. ZOISITE IS RARE.	IN SCHISTS AND GNEISSES (LESS COMMON THAN CLINOZOISITE), IN QUARTZ VEINS.
EPIDOTE GROUP	CLINOZOISITE $Ca_2Al_3O(OH)(Si_2O_7)(SiO_4)$ MONOCLINIC, 2 2/m	(001), (100), ($\bar{1}$01), ($\bar{1}$11) (001) A 6½ 3.38	PALE GREEN, GRAYISH WHITE WHITE VITREOUS	PRISMATIC CRYSTALS ELONGATED AND STRIATED ‖ b, MASSIVE, GRANULAR, COLUMNAR	FUSES AT ~ 1350°C WITH INTUMESCENCE. LIGHTER THAN EPIDOTE. RESEMBLES ZOISITE.	DIMORPHOUS WITH ZOISITE. FORMS ISOMORPHOUS SERIES WITH EPIDOTE.	IN LOW AND MEDIUM GRADE METAMORPHIC ROCKS. AS AN ALTERATION OF PL, AGIOCLASE COMMONLY WITH AMPHIBOLE.
EPIDOTE GROUP	EPIDOTE $Ca_2(Al,Fe)Al_2O(SiO_4)(Si_2O_7)(OH)$ MONOCLINIC, 2 2/m	(001), (100), ($\bar{1}$01), ($\bar{1}$11) (001) A 7 3.39*	YELLOW TO BROWN, ISH GREEN, BL ACK WHITE VITREOUS	COARSE TO FINE GRANULAR, PRISMS ELONGATED AND STRIATED ‖ b, FIBROUS.	FUSES AT ~ 1150°C WITH INTUMESCENCE, YELLOWISH GREEN COLOR AND ONE DIRECTION OF PERFECT CLEAVAGE ARE DIAGNOSTIC.	FORMS ISOMORPHOUS SERIES WITH CLINOZOISITE, IN PIEDMONTITE, VIOLET-RED, Mn REPLACES Al.	IN LOW AND MEDIUM GRADE METAMORPHIC ROCKS AND CONTACT-METAMORPHOSED LIMESTONES, ALSO WITH ZEOLITES IN AMYGDALES.
	ALLANITE $(Ca,RE)_2(Al,Fe,Mg)_3(SiO_4)(Si_2O_7)(OH)$ MONOCLINIC, 2 2/m	(001) E 5½ 3.50	BLACK-BROWN GRAY BROWN VITREOUS, SUBMETALLIC, PITCHY	MASSIVE AND AS EMBEDDED GRAINS, HABIT SIMILAR TO THAT OF EPIDOTE.	WEAKLY RADIOACTIVE. COMMONLY METAMICT.	RE = RARE EARTHS. COMPOSITION IS VARIABLE.	MINOR ACCESSORY IN GRANITE, SYENITE, DIORITE, PEGMATITE.

CYCLOSILICATES

	AXINITE $Ca_2(Fe,Mn)Al_2(BO_3)Si_4O_{12}(OH)$ TRICLINIC, 1	(010), ($\bar{1}$20), ($\bar{1}$10), ____ (100) C 7 3.30	VIOLET TO BROWN WHITE VITREOUS	WEDGE-SHAPED CRYSTALS, MASSIVE, LAMELLAR, OR GRANULAR.	FUSES EASILY (~ 1100°C) WITH INTUMESCENCE. AXE-SHAPED CRYSTALS ARE DIAGNOSTIC.		IN CONTACT-ALTERED CALCAREOUS ROCKS, GRANITE, AND HYDROTHERMAL VEINS.
	BERYL $Be_3Al_2Si_6O_{18}$ HEXAGONAL,	(10$\bar{1}$0), (0001) (0001) D 8 2.75	PALE GREEN, WHITE, YELLOW WHITE VITREOUS	PRISMATIC, CRYSTALS, MASSIVE, COMMONLY VERTICALLY STRIATED.	INSOLUBLE. FUSES WITH DIFFICULTY AT ~ 1388°C. HARDER THAN APATITE; DENSITY IS GREATER THAN QUARTZ.	AQUAMARINE (BLUE) MORGANITE (PINK) EMERALD (GREEN) ARE GEM VARIETIES.	IN GRANITE PEGMATITES, ALSO IN MICA SCHISTS.
	CORDIERITE $(Mg,Fe)_2Al_3(AlSi_5O_{18})$ ORTHORHOMBIC	(010) D OH(110) 7 2.65	VARIOUS SHADES OF BLUE WHITE VITREOUS	MASSIVE OR AS IRREGULAR GRAINS, AS PRISMATIC PSEUDOMEX, ADONAL TWINS.	FUSIBLE ON THIN EDGES, WHEN COLORL ESS RESEMBLES QUARTZ. DICHROIC.		ALTERS READILY TO MUSCOVITE OR CHLORITE ACCESSORY IN GRANITE, GNEISS, SCHISTS, HORNFELS.
	TOURMALINE $Na(Mg,Fe)_3Al_6(BO_3)_3(Si_6O_{18})(OH)_4$ TRIGONAL, 3m	(11$\bar{2}$0), (0$\bar{1}$10), (10$\bar{1}$1),.... (11$\bar{2}$0), (10$\bar{1}$1) D 7½ 3.10	BL ACK, BROWN, PINK, GREEN,..... WHITE VITREOUS	VERTICALLY STRIATED PRISMATIC CRYSTALS, OFTEN WITH ROUNDED TRIANGULAR CROSS-SECTION.	FUSIBILITY DIFFERS WITH COMPOSITION. DICHROIC. STRONGLY PYRO- AND PIEZOELECTRIC.	BL ACK VARIETY IS SCHORLITE. DISTINGUISHED FROM HORN BL ENDE BY ABSENCE OF PRISMATIC CLEAVAGE.	IN GRANITE PEGMATITES, ACCESSORY IN SCHISTS AND GNEISS. Mg-RICH VARIETY (BROWN) IN METAMORPHOSED LIMESTONE.

UNCLASSIFIED SILICATES

	PREHNITE $Ca_2Al_2Si_3O_{10}(OH)_2$ ORTHORHOMBIC, mm2	(001) C 6½ 2.9	PALE GREEN, WHITE OR GRAY WHITE VITREOUS	MASSIVE, GLOBULAR, OR STALACTITIC. TABUL AR ‖ (001)	FUSES AT ~ 900°C WITH INTUMESCENCE TO A WHITE ENAMEL. HABIT AND COLOR ARE DIAGNOSTIC.	EASE OF FUSION DISTINGUISHES IT FROM QUARTZ, BERYL, AND HEMIMORPHITE.	WITH ZEOLITES LINING CAVITIES IN BASIC IGNEOUS ROCKS. ALSO ASSOCIATED WITH DATOLITE, PECTOLITE, CALCITE.
	CHRYSOCOLLA $Cu \cdot SiO_3 \cdot 2H_2O$	3–4 2.2	GREEN OR GREENISH BLUE WHITE VITREOUS, WAXY	COMMONLY CRYPTOCRYSTALLINE OR AMORPHOUS. COMPACT MASSIVE OR EARTHY.	CONCHOIDAL FRACTURE. COMMONLY IMPURE. COMPOSITION VARIABLE. INFUSIBLE.	LESS HARD THAN TURQUOISE. DOES NOT EFFERVESCE WITH HCl.	SECONDARY IN THE OXIDIZED ZONE OF COPPER DEPOSITS WITH MALACHITE, AZURITE, CUPRITE, NATIVE COPPER.
	DUMORTIERITE $(Al,Fe)_7B_2Si_3O_{18}$ ORTHORHOMBIC, 2/m 2/m 2/m	(100) C, (110) F 7 3.38	BLUE, VIOLET, PINK WHITE VITREOUS, DULL	IN COLUMNAR OR FIBROUS MASSES.	INFUSIBLE. LOSES COLOR ON IGNITION. FIBROUS HABIT IS DIAGNOSTIC, AS IS THE COLOR.		IN ALUMINUM-RICH METAMORPHIC ROCKS AND RARELY IN PEGMATITES. DUMORTIERITE IS RARE, BUT OCCURS IN LARGE AMOUNTS IN A FEW LOCALITIES.

Laboratory Apparatus Improvement

The National Science Foundation recently awarded 56 grants totalling over $700,000 to staff members of U. S. colleges and universities to aid in the development of apparatus to modernize instruction. Among the 56 grants was one which was indirectly related to the geological sciences. This award was made to George A. Parks of Stanford University for the development of an optical analog of continuous X-ray analysis and control systems used in mineral or chemical processing plants.

Geophysics Exam Announced

The U. S. Civil Service Commission has recently announced an examination for Geophysicists, grades GS-5 to GS-15 ($4,940 to $12,770). Positions will offer two options, 1. Exploration and Experimentation and 2. Earth Physics, Geomagnetism and Seismology. No written examination is required. For further information obtain announcement No. 232B issued June 1, 1960 at your local post office or directly from the U. S. Civil Service Commission.

NESOSILICATES

WILLEMITE Zn_2SiO_4 TRIGONAL		(0001) C 5½ 3.9-4.2	YELLOW-GREEN, RED, BROWN WHITE VITREOUS TO RESINOUS	MASSIVE OR GRANULAR. RARELY IN CRYSTALS.	INFUSIBLE. SOLUBLE IN HCl WITH FORMATION OF GELATINOUS RESIDUE. FLUORESCES GREEN.			IN OXIDIZED ZONE OF Zn DEPOSITS, WITH FRANKLINITE AND ZINCITE IN METAMORPHOSED LIMESTONE AT FRANKLIN, N. J.
OLIVINE	FORSTERITE Mg_2SiO_4 ORTHORHOMBIC	(010) E 6½ 3.22	OLIVE-GREEN, WHITE WHITE or GRAY VITREOUS	GRANULAR MASSES AND AS ROUNDED GRAINS.	INFUSIBLE. DISSOLVES IN HOT (1:1) HCl WITH SEPARATION OF GELATINOUS SILICA.	CONTINUOUS ISOMORPHOUS SERIES. BIVALENT ELEMENTS PROXY FOR Mg & Fe TO FORM OTHER ISOMORPHOUS SPECIES, e.g. MONTICELLITE, $CaMgSiO_4$.	TYPICALLY IN BASIC AND ULTRABASIC IGNEOUS ROCKS, IN NODULES IN BASALT, IN STONY AND STONY-IRON METEORITES, IN CRYSTALLINE DOLOMITIC LIMESTONES. ALTERS READILY TO SERPENTINE.	
	FAYALITE Fe_2SiO_4 ORTHORHOMBIC	(010) E 6½ 4.39	BROWN-BLACK WHITE or GRAY VITREOUS	Do.	Do.			
ALUMINUM SILICATE GROUP	ANDALUSITE Al_2SiO_5 ORTHORHOMBIC	(110) C 7½ 3.15	VARIABLE; WHITE, GRAY, RED, BROWN WHITE VITREOUS, DULL	COARSE PRISMATIC CRYSTALS WITH SQUARE CROSS-SECTION, MASSIVE.	VAR. CHIASTOLITE HAS DARK INCLUSIONS THAT APPEAR CRUCIFORM IN SECTIONS ⊥ PRISM AXIS. INFUSIBLE.			IN METAMORPHOSED SHALES, AND REGIONALLY METAMORPHOSED ROCKS. ALTERS READILY TO SERICITE.
	SILLIMANITE Al_2SiO_5 ORTHORHOMBIC	(010) A 7 3.24	WHITE, BROWN, GREEN WHITE VITREOUS	FINELY FIBROUS OR COARSE PRISMATIC MASSES.	INFUSIBLE. INSOLUBLE. CHARACTERIZED BY SLENDER CRYSTALS WITH ONE CLEAVAGE.	RESEMBLES TREMOLITE & WOLLASTONITE BUT IS INFUSIBLE & INSOLUBLE IN ACIDS.		IN HIGHEST GRADE METAMORPHIC ROCKS, SCHISTS AND GNEISSES. ASSOCIATED WITH CORUNDUM.
	KYANITE Al_2SiO_5 TRICLINIC, T	(100) A, (010) C 6 3.63	BLUE, GRAY, GREEN, OR WHITE WHITE VITREOUS, PEARLY	ELONGATED TABLETS OR BLADED MASSES. DISTINCTLY FLEXIBLE.	+VARIABLE: 4-5½ ⊥, 6-7 ∥. INFUSIBLE, INSOLUBLE. HABIT, COLOR, CLEAVAGE, & VARIABLE HARDNESS ARE DIAGNOSTIC.	MULLITE (RARE AS A MINERAL) FORMS WHEN KYANITE (AND ANDALUSITE, SILLIMANITE) IS HEATED TO A HIGH TEMPERATURE.		IN MEDIUM-GRADE REGIONALLY METAMORPHOSED ALUMINUM-RICH ROCKS. ACCESSORY IN GNEISS AND MICA SCHIST WITH GARNET, STAUROLITE, CORUNDUM.
	STAUROLITE $HFe_2Al_9Si_4O_{24}$ MONOCLINIC,	(110), (hk0), (010), (001) (010) C 7 3.70	BROWN GRAY RESINOUS TO VITREOUS	AS CRYSTALS, RARELY MASSIVE. GENERALLY TWINNED.	+ CRUCIFORM TWINS VERY COMMON. INFUSIBLE, INSOLUBLE. HABIT, TWINNING, & COLOR ARE DIAGNOSTIC.			IN MEDIUM-GRADE METAMORPHIC ROCKS, ALUMINUM-RICH CRYSTALLINE SCHISTS, SLATES, AND GNEISSES.
	TOPAZ $Al_2SiO_4(OH, F)_2$ ORTHORHOMBIC	(001), (010), (110), (120), &c. (001) A 8 3.50	COLORLESS OR PALE YELLOW WHITE VITREOUS	AS PRISMATIC CRYSTALS, ALSO MASSIVE, COARSE TO FINE GRANULAR.	INSOLUBLE, INFUSIBLE. CRYSTALS COMMONLY STRIATED. HABIT, HARDNESS, & CLEAVAGE ARE DIAGNOSTIC.			ACCESSORY IN HIGHLY SILICEOUS ROCKS. ASSOCIATED WITH TOURMALINE, FLUORITE, APATITE, CASSITERITE, BERYL, QUARTZ, ETC., PLACERS.
GARNET GROUP	PYROPE $Mg_3Al_2(SiO_4)_3$ ISOMETRIC	(110), (211), (321), &c. NONE 7 3.84	DEEP RED TO NEARLY BLACK WHITE VITREOUS TO RESINOUS	AS CRYSTALS, ALSO MASSIVE, COARSE TO FINE GRANULAR, COMMONLY DETRITAL.	FUSES AT 3-3½ (~ 1030°C – INFUSIBLE IN BUNSEN BURNER FLAME, BUT FUSES EASILY IN BLOWPIPE FLAME).			IN ULTRABASIC ROCKS AND SERPENTINES, IN HIGH-GRADE MAGNESIUM-RICH METAMORPHIC ROCKS.
	ALMANDITE $Fe_3Al_2(SiO_4)_3$ ISOMETRIC	Do. Do. Do. 7 4.33	DEEP RED, BROWNISH RED, BLACK Do. Do. Do.	Do.	Do. ALMANDITE FUSES TO MAGNETIC GLOBULE.			IN SCHISTS AND GNEISSES, ALSO IN GRANITE, RHYOLITE, PEGMATITE.
	SPESSARTITE $Mn_3Al_2(SiO_4)_3$ ISOMETRIC	Do. Do. Do. 7 4.19	BROWNISH TO RED. Do. Do. Do.	Do.	Do.			IN GRANITES, METAMORPHOSED Mn-BEARING ROCKS, RHYOLITE.
	GROSSULARITE $Ca_3Al_2(SiO_4)_3$ ISOMETRIC	Do. Do. Do. 7 3.56	WHITE, PALE GREEN, YELLOW Do. Do. Do.	Do.	Do.			IN CONTACT OR REGIONALLY METAMORPHOSED LIMESTONE. ASSOCIATED WITH CALCITE, WOLLASTONITE, IDOCRASE.
	ANDRADITE $Ca_3Fe_2(SiO_4)_3$ ISOMETRIC	Do. Do. Do. 7 3.84	YELLOW, GREEN, BROWN TO BLACK Do. Do. Do.	Do.	Do. ANDRADITE FUSES TO MAGNETIC GLOBULE.			IN LIMESTONE METASOMATICALLY ALTERED BY IRON-BEARING SOLUTIONS, IN ORE DEPOSITS IN CALCAREOUS ROCKS.
	UVAROVITE $Ca_3Cr_2(SiO_4)_3$ ISOMETRIC	Do. Do. Do. 7 3.89	EMERALD-GREEN Do. Do.	Do.	ALMOST INFUSIBLE BELOW 1400°C.			ASSOCIATED WITH CHROMITE IN SERPENTINE
	ZIRCON $Zr\,Si\,O_4$ TETRAGONAL,	(110), (111), (100), &c. (110) E GENICULATED 7½ 4.68	BROWN TO RED BROWN, COLORLESS, GRAY, ETC. WHITE ADAMANTINE	PRISMATIC CRYSTALS TERMINATED BY PYRAMIDS, IN IRREGULAR GRAINS.	INFUSIBLE, INSOLUBLE. PHYSICAL PROPERTIES ARE DIAGNOSTIC.	THORITE AND XENOTIME ARE ISOTYPIC.		ACCESSORY IN IGNEOUS ROCKS, DETRITAL IN SANDS AND IN PLACERS.
	SPHENE $Ca\,Ti\,Si\,O_5$ MONOCLINIC,	(001), (111), (110) (110) C GN (100) 5½ 3.50	BROWN, GRAY WHITE ADAMANTINE	THIN WEDGE-SHAPED CRYSTALS.	FUSIBLE AT 1200°C. COLOR, HABIT, AND LUSTER ARE DIAGNOSTIC. HARDNESS < STAUROLITE AND > SPINEL ENTE.			ACCESSORY IN INTERMEDIATE AND ACID IGNEOUS ROCKS, IN GNEISS, CHLORITE SCHIST, AND CRYSTALLINE LIMESTONE.
	DATOLITE $Ca\,B\,(OH)\,Si\,O_4$ MONOCLINIC,	NONE 5½ 2.80	COLORLESS, WHITE, PALE YELLOW OR GREEN WHITE VITREOUS	IN SHORT PRISMATIC CRYSTALS, GRANULAR IN COMPACT PORCELAIN-LIKE MASSES.	FUSES EASILY IN BUNSEN BURNER FLAME (888°C) TO A CLEAR GLASS, COLORS FLAME GREEN (BORON)	MORE READILY FUSIBLE THAN QUARTZ.		ALWAYS SECONDARY, IN AMYGDALES ASSOCIATED WITH ZEOLITES AND CALCITE.
	CHONDRODITE $Mg_5(F,OH)_2(SiO_4)_2$ MONOCLINIC,	(010) (001) D 6 3.15	LIGHT YELLOW TO DEEP RED RESINOUS TO VITREOUS	IN ISOLATED GRAINS, MASSIVE.	GELATINIZES WITH HCl. COLOR DISTINGUISHES IT FROM OLIVINE.	OTHER MEMBERS OF THE HUMITE GR., NORBERGITE, HUMITE AND CLINOHUMITE, ARE SIMILAR.		IN METAMORPHOSED LIMESTONE OR DOLOMITE, ASSOCIATED WITH PHLOGOPITE, SPINEL, PYRRHOTITE, AND GRAPHITE.
	URANOPHANE $Ca(H_2O)_2(UO_2)_2(SiO_4)_2 \cdot 3H_2O$ MONOCLINIC,	(100) A 3½ 3.8	YELLOW VITREOUS, DULL	ACICULAR CRYSTALS, MASSIVE, FELTED COATINGS.	MAY FLUORESCE WEAKLY (GREEN)	RESEMBLES BETA-URANOPHANE AND SKLODOWSKITE		SUPERGENE, IN THE OXIDIZED ZONE OF VEIN DEPOSITS. ALTERED FROM URANINITE.

Correction

In the article *Geology Degrees During the Decade of the Fifties* appearing in the May-June 1961 issue of GeoTimes, Syracuse University was credited with a total of four doctorates in geology for the 10-year period. Actually, Syracuse University granted a total of twelve such degrees, four of them being in science teaching (geology). This discrepancy was due to faulty communications.

Science Teacher Receives Earth Science Study Award

Rodger V. Ricks, science teacher at Madison High School, Rexburg, Idaho, was awarded the only fellowship for summer study of earth sciences out of 234 fellowship awards to teachers of science and math by the National Science Foundation. He is studying at the University of South Dakota.

COMMITTEE OF ONE HUNDRDED FOR AGI

The little-publicized Committee of One Hundred for AGI has been one of the key factors in the effort to provide financial stability for the Institute over the past five years while it was striving to seek professional acceptance.

The Committee of 100 was launched in 1956 through the efforts of E. A. Eckhardt, ably assisted by a number of fellow geologists. The contributors to the Committee of One Hundred pledged a contribution of $100 per year for five years. Others have given stock or royalties in lieu of cash contributions.

Some of the original members have completed their contributions this year, others have still several years' participation. As the Committee of One Hundred commitments are completed, new sources of funds must be developed to replace this segment of AGI support. The AGI Finance Committee has this matter under study.

COMMITTEE OF ONE HUNDRED

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F. L. Aurin
Robert Balk (memorial)
Roland F. Beers
Anonymous contributor
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Ira H. Cram
Morgan J. Davis
L. Decker Dawson, Jr.
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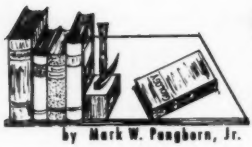
Theron Wasson



Popular Geology in print

by Mark W. Pengborn, Jr.

Just the thing to give your layman friends who are curious about the Mohole is A HOLE IN THE BOTTOM OF THE SEA (Doubleday, 1961, $4.95) by oceanographer-in-charge, *Willard Bascom*. Thoroughly interesting and informative, this volume traces the origin of the Mohole idea, summarizes our knowledge of the earth's interior and describes the various techniques used thus far to explore it; Bascom then lists his objectives, and concludes with a review of the awesome problems involved in reaching through 3 miles of water to drill 3 miles of hole; illustrations adequate, but unfortunately no bibliography. Equally good, and for the same audience—ages 14 up—is science reporter *Walter Sullivan's* ASSAULT ON THE UNKNOWN (McGraw-Hill, 1961, $7.95), a review of the accomplishments of IGY. About half the volume is devoted to rocketry and such space phenomena as the Van Allen belts; the remainder deals with the atmosphere, glaciology, ocean currents and deeps, sea-level changes, and the earth's shape. There is a good list of sources; more maps and diagrams would help.

Latest in the fine "Science study series" is WATER, THE MIRROR OF SCIENCE (Doubleday, 1961, $.95) by experts *Kenneth S. Davis* and *John A. Day;* this little book might be described as a series of essays on the properties of water, water as a geologic force and energy custodian, the place of water in living matter, and, finally, man's growing water problem. For the adult or senior high student with science interests; bibliographic footnotes.

Intended for youngsters 10 to 14, but so straightforwardly written that it will charm grown-ups, is biochemist *Isaac Asimov's* THE DOUBLE PLANET (Abelard-Schuman, 1960, $3). Among subjects covered are the earth's shape, internal make-up, magnetism, radiation belts, and tides, and the moons orbit, composition, and surface characteristics; a bibliography and a few more diagrams would have made this book just about perfect.

Recent worthwhile paperback reprints include *Carroll Lane Fenton's* GIANTS OF GEOLOGY (Doubleday, $.95), containing biographical sketches of some 30 great geologists, ADVENTURES WITH THE MISSING LINK (Viking, 1961, $1.65), *Raymond A. Dart's* choice account of *Australopithecus* and how he discovered it, *George Gaylord Simpson's* THE MEANING OF EVOLUTION (Yale, 1960, $1.45), a rather philosophical look at the doctrine of evolution and its significance to man, and THE EXPLORATION OF THE COLORADO RIVER AND ITS CANYONS (Dover, 1961, $2), a reprint of *John Wesley Powell's* "Canyons of the Colorado," published in 1895 and incorporating the diary of his first trip down the Colorado with the text of his 1870 expedition among the Pueblo Indians, richly illustrated.

KGS Field Conference

September 14-16

The Kansas Geological Society announces its 26th Annual Field Conference to be held along the Mississippi River in eastern Missouri and western Illinois September 14-15 & 16, 1961. This conference is to be held in cooperation with the Missouri Geological Survey and the State Geological Survey of Illinois. Headquarters for the Meeting will be the Mark Twain Hotel in beautiful old Hannibal, Missouri. The conference will study rocks of Middle Ordovician to lower Pennsylvanian age along the Mississippi River between Hannibal and St. Louis, Missouri. Principal attention will be given to the Siluro-Devonian and Mississippi boundary problems in Missouri and Illinois. Dr. Thomas Beveridge, Missouri State Geologist will serve as the Conference director this year and he will be assisted by members of the Missouri Geological Survey and State Geological Survey of Illinois.

Due to the recent and increasing emphasis being placed on exploration for oil and gas in the Mississippian Rocks, (both in Oklahoma and Kansas), it is believed that this conference will prove especially interesting and informative to the geologist associated with this problem.

Evening arrangements in historic old Hannibal, river-town home of Samuel Clemens, include a visit to Mark Twain's boyhood home and museum, and other points of interest immortalized in *Tom Sawyer* and *Huckleberry Finn*.

All field trips will be conducted entirely from air-conditioned buses, which have been chartered specifically for this meeting. An excellent agenda has been prepared by the hosts and it is hoped that there will be a large turnout for this conference. Additional information can be obtained from ORVIE L. HOWELL, *Field Trip Chairman, Kansas Geological Society, Lario Oil and Gas Company, 301 South Market, Wichita, Kansas.*

DEAR EDITOR:

In the "Books" column of GEOTIMES for April, 1961, reference is made to my recent publication "Opportunities in Geology and Geological Engineering." You comment that a serious oversight is the failure to cite AGI Report 11, "Directory of Geoscience Departments in the Colleges and Universities of the United States and Canada."

For your information I quote from p. 24 of the manual:

"Before selecting one of the 250 institutions in the United States and Canada which grant Bachelor's degrees in geology (Appendix B) the student will benefit from a study of "DIRECTORY OF GEOSCIENCE DEPARTMENTS IN THE COLLEGES AND UNIVERSITIES OF THE UNITED STATES AND CANADA," published periodically by the American Geological Institute, 2101 Constitution Ave., N. W., Washington 25, D. C. This valuable booklet lists faculties, undergraduate and graduate courses presented, and major requirements for degrees, including credits in each course. About one-tenth of these colleges offer geological engineering; some of these give the students a choice of either a geology curriculum or a geological engineering curriculum."

In justice to myself and the publishers I wish to request that you make a correction.

Sincerely,

A. K. SNELGROVE,
Prof. and Head
Michigan Tech.

DEAR EDITOR:

An excellent editorial in the current issue (April) of GEOTIMES.

The *lethargy* of we-all who are no longer "Young Turks" is, I hope, not due to low voltages in our batteries of enthusiasm, but to a shortage of stimulating exploratory energy and physical amperage.

Concepts in science should be actively and constantly challenged by constructive mental and physical exploration with the new "tools" of discovery. Yet, if most of the younger generation (less than 70) were vociferous dissenters, what a bedlam (more so than now) would be the annual conventions of the AGI member societies. It is really a bit difficult at time to discern the real fire because of the dense smoke. (Poetic license is permissible in the use of metaphors.) This is an epoch of tranquilizers—not of anti-tranquilizers!

It is an axiom of exploration that a good wagon road is less effort than to blaze a forest trail to obtain the first view of a magnificent mountain.

With best wishes,

Cordially yours,

ARTHUR BEVAN

NNS—not no new starts but,
now new science

DEAR SIR:

Since the American Geological Institute through its magazine GEOTIMES has strongly promoted the *Mohole Project*, I call your attention to the note by Norman C. Smith in the May issue of the Bulletin of the American Association of Petroleum Geologists. After reading most of the promotional literature for this scheme, I am of the opinion that the vast sums of money which the promoters plan to spend are grossly out of proportion to the modicum of limited useable information likely to be acquired.

We are lectured from time to time on the need for professional responsibility. The promotion of a spectacular scientific boondoggle, the chief merit of which is that it undertakes to spend gigantic sums of public money, is a sorry example.

Why not see to it that Smith's request for an accounting is filled?

Sincerely,

GERALD P. SALISBURY

DEAR EDITOR:

Your April edition of GEOTIMES is very stimulating. Perhaps this is because of the articles on the analog, a subject of great interest and one by Harvey Banks, my former boss. It appears that this is a "new" GEOTIMES.

I can't help but add a little to your editorial. I have in the past been astounded at the apathy of many geologists. While apathy is perhaps more prevalent in the entire nation than we would like to admit, among geologists in these times it is deadly.

I feel that the apparent lack of "new frontiers" is real in many areas of geology

and in many geologists, but I am also convinced that more new geologic frontiers are being explored than it is possible to tell about.

I agree with you that new concepts and ideas are bred by contacts in other fields. I feel that GEOTIMES is doing the geology profession a great service by presenting these philosophies. Keep up the good work.

Very truly yours,

ROBERT G. THOMAS

DEAR SIR:

The article *"Geologic aspect of Coast and Geodetic Survey operations"* by Rear Admiral H. Arnold Karo that appeared in the March 1961 issue of GEOTIMES was most interesting. Its reference to the "lava sediments" of the San Joaquin Valley of California was even illuminating.

The article is detailed and well written. Its preparation was not a simple matter and obviously the author spent many hours in research and writing. . . .

Sincerely,

JOHN LOGAN

ROCK CHIPS

by SANDSTONE SAM

From the geology exam papers:

The zone directly above the water table is known as the caterpillar zone.

• • •

Relief—the movement of letting go, such as a stream dropping its load.

• • •

Q. Give an example of mass wasting.
A. Americans throwing away food.

The Idaho Springs gneiss was badly metamorphized and strongly diastrophosed.

• • •

A mature valley takes on that well-rounded look.

The handle of the door of opportunity is clearly marked PUSH.

• • •

The difference between a geological genius and an idiot is 23 feet of saturated sand.

Gettysburg Battle *Cont. from page 12*

reconnoiter the situation. Hancock reported that the Union position at Gettysburg was strong, though it could be turned rather easily, and recommended that, as the battle had already begun, it be fought out there.

On July 2 Lee took position along Seminary Ridge and launched a series of attacks against the southern end of the Union line—the Round Tops. Devils Den, a mass of diabase boulders facing Little Round Top across Plum Run, became the scene of bitter fighting. After the Confederates had taken Devils Den, they used sharpshooters, sheltered by the huge boulders, to pick off troops on Little Round Top, throughout much of the day. Partly because Longstreet's Corps was late in starting, the attack on the Round Tops was only partly successful and the southern end of the Union line was not turned as it might have been. On July 3, Lee, having attacked the Union right and left flanks, attempted to break the center by a charge led by Pickett's fresh division. The charge failed, partly at least because it was not supported on either flank, and the Battle of Gettysburg ended with the Federal army holding its position.

Almost until its end the battle could have gone either way. Lacking the services of the redoubtable "Stonewall" Jackson, dead these two months, and in the absence of Stuart, Lee did not have his army under full control until July 2 and admittedly fought his worst battle. Meade, sound and methodical, won because he handled the Army of the Potomac better than it had been handled by any previous commander. It is ironic that for this achievement he has received more blame than praise.

Meade has been criticized for preferring to fall back to his Pipe Creek line before meeting Lee. His reasoning was sound, however, for as Hancock had reported, the heights could be turned. If Ewell on July 1 and Longstreet on July 2 had done what they should have done, Meade's forces would have been outflanked, and there is good reason to believe that, had not the Confederate command system broken down, Meade would have been driven from the Gettysburg position. If that had happened, he would have had no choice but to fall back on his Pipe Creek line.

The Union position at Gettysburg had another weakness that became more and more evident as the battle progressed; owing to the geology, it could not be

entrenched. The resistant diabase sill is so close to the surface that it was impossible for the soldiers to "dig in," and what little protection they could obtain was provided by existing stone walls, outcrops of rock such as Devils Den, and isolated boulders. The Union Army, because of the inability to entrench its position, suffered heavy losses of 25,000 men killed, wounded, and missing, whereas the attacking Confederates lost only a little more than 20,000 men. It is almost an axiom of infantry warfare that an attacking army must expect heavier losses than a defending force, which ordinarily will be entrenched; yet at Gettysburg the defenders lost more, both actually and proportionately, than the attackers. Unlike the Gettysburg line, Meade's preferred position on Parrs Ridge behind Pipe Creek could have been effectively entrenched.

The Retreat

July 4 to July 14

Throughout July 4 the two badly mauled armies faced each other across the field of Pickett's charge, burying their dead and succoring their wounded. Meade did not attack, though the Confederate position, like the Federal, could not be entrenched to any appreciable degree. The Confederate wounded and supply trains were sent westward through Cashtown Gap, while the main army prepared to retreat through South Mountain at Fairfield Gap. On the 5th the Federals followed, but decided that Fairfield Gap could not be forced. Accordingly, Meade sent his infantry south to Frederick and into the Great Valley through Turners Gap. Lee won the race to Williamsport, where he planned to cross the Potomac. There he fortified a strong line east of the town, anchored on the Potomac and on Conococheague Creek. Meanwhile the river had risen, and it was not until the night of July 13-14 that the Confederates were able to cross on rebuilt bridges. Meade, who had planned to attack the Confederate works on the 14th, marched in to find empty fortifications. He crossed the river and followed Lee south, and within a matter of weeks both the Army of Northern Virginia and the Army of the Potomac were just where they had been on June 3—facing each other across the Rapidan River.

REFERENCES

G. W. Stose and F. Bascom, 1929, *Fairfield-Gettysburg Folio*, U.S.G.S. Folio 229, Washington, D. C.

G. W. Stose, 1932, *Geology and Mineral Resources of Adams County, Pa.*, 153 pp., map, Penna. Topographic and Geological Survey, Harrisburg, Pa.

NAGT *Continued from page 23*

Carey Croneis of Rice Institute, president in 1960, made the following pertinent remarks about the Association: "The meetings of the Sections have always been unusually successful, and the vitality and general enthusiasm of our Sections must be maintained at all costs. We should not, however, lose sight of the fact that these effective units of our organization must be welded into a powerful and unified national Association. Moreover the interests of the teachers of geology at the richly contributing smaller colleges must be as vigorously represented as those of the major universities."

With growth, and the stronger financial position which may be reasonably expected in the future, NAGT should be able to carry on its program on a broadening front and with increased effectiveness; it can also undertake new responsibilities. Programs at recent national meetings have attracted capacity attendance; future programs, if of equal excellence and timeliness, will necessitate larger meeting places to accommodate the crowds. The *Journal of Geological Education* will, in all probability, be issued on a quarterly basis, beginning in 1962. The practicability of establishing a national NAGT Headquarters, with a permanent, full-time Executive Secretary, is receiving serious consideration. These are realistic goals for the future, and others might be mentioned.

Meanwhile, NAGT can move forward toward its traditional goals, particularly through cooperation with other organizations having kindred purposes, such as AGI. As Carey Croneis noted, "relations with the A. G. I. are close and proving to be increasingly fruitful. They should be continued, as in the joint efforts of the two groups in connection with the Foreign Seminar in Geology,[1] and with reference to the new Curriculum and Course Content Committee."

Recently, Robert C. Stephenson, Executive Director of AGI, remarked succinctly, "NAGT is an organization pointed to the future." In that future lie many and challenging opportunities.

ACKNOWLEDGMENTS

The writer is indebted to many individuals for help in the preparation of this article. Charles D. Campbell and Robert C. Stephenson suggested the scope and emphasis deemed desirable. Dorothy J. Gore and Robert E. Boyer provided some of the current data on NAGT. Herbert E. Hendriks furnished the portrait of Neil A. Miner and the group photo taken at the 1938 Annual Meeting of the Association. The following members of NAGT kindly reviewed the manuscript: J. Robert Berg, David M. Delo, Rudolph W. Edmund, Dorothy J. Gore, William F. Read, and Roger L. Spitznas.

[1] The International Field Institute, sponsored by AGI under a grant from the National Science Foundation. With the assistance of a committee representing NAGT, the Selection Committee of AGI chose twenty young geology teachers, out of a field of more than one hundred applicants, to participate in geological field excursions in the British Isles during the summer of 1961. See GEOTIMES, January-February, 1961, pages 14-17, and April, 1961, page 22.

Texas Tech Offers Ph.D. in Geology

The Department of Geology at Texas Technological College in Lubbock, Texas has been granted permission by the Texas Commission on Higher Education to offer a doctorate in geology. Chairman of the Texas Tech. geology department is F. Alton Wade.

Geologists Named to Ohio Academy Posts

Dr. Kenneth Caster of the University of Cincinnati was recently elected President-elect of the Ohio Academy of Science and Dr. John R. Coash of Bowling Green State University was elected Director of Public Relations.

SOURCES

Proceedings, News Letters, and Transactions of the Association of Geology Teachers, 1939-1954. Mimeographed series. Also early correspondence. These sources preserved in Archives of Augustana College.

Journal of Geological Education, 1951 to date. Especially News and Notes, and, since 1955, Transactions (including addresses, and reports of officers and committees); also the following papers:

SHAFFER, PAUL R., *The Association of Geology Teachers*. Foreword to Vol. 1, No. 1, 1951.

LOWE, KURT E., *The First Milestone*. Vol. 1, No. 3, 1952, pages 1-3.

FRYXELL, F. M., *The Estate of Teaching in Geology*. Vol. 1, No. 6, 1953, pages 13-29.

ROBERTSON, PERCIVAL, *The Association of Geology Teachers—A Janus'-Eye View*. Vol. 1, No. 6, 1953, pages 30-40.

LONGWELL, CHESTER R., *The AGT and the AGI*. Vol. 2, No. 2, 1954, pages 43-48.

———, *Constitution of the National Association of Geology Teachers*. Vol. 7, No. 1, 1959, pages 46-48.

ROSALSKY, MAURICE B., *Membership Statistics, National Association of Geology Teachers*, Vol. 9, No. 1, 1961, pages 47-49.

ESSENTIALS OF EARTH HISTORY, *by W. L. Stokes, 1960, 502 pp., Prentice-Hall, Inc., Englewood Cliffs, N. J., $8.75*

A textbook of historical geology which is designed to give over-all perspective of the subject without becoming bogged down with fossil names and local details.

X-RAY METALLOGRAPHY, *by A. Taylor, 1961, 993 pp., John Wiley & Sons, Inc., 440 Park Ave. South, New York 16, N. Y., $27.00.*

An introductory yet comprehensive text on the fundamentals and application of X-ray methods in practical and research metallurgy.

PORE PRESSURE AND SUCTION IN SOILS, *1961, 151 pages, Butterworth Inc., 7235 Wisconsin Ave., Washington 14, D. C., $11.25.*

A series of 17 papers with discussions from the March 1960 conference of the International Society of Soil Mechanics and Foundation Engineering.

GEOLOGY OF THE PARADOX BASIN FOLD AND FAULT BELT. *3rd Field Conference 1960, 173 pp. Four Corners Geological Society. Obtain from Petroleum Information, Box 2612, Denver, Colorado.*

MINERAL RESOURCES OF COLORADO, FIRST SEQUEL, *by S. M. del Rio, 1960, 764 pp., Colorado State Mineral Resources Board, 204 State Building, Denver 2, Colorado, $5.00.*

This review compilation relative to the mineral resources of Colorado is a sequel to an earlier report by John W. Vanderwilt. Deals with mineral resources including metals, coal, oil shale and petroleum and natural gas.

A CLIMBERS GUIDE TO GLACIER NATIONAL PARK, *by Gordon Edwards, 1960, 141 pp., Sierra Club, Mills Tower, San Francisco 4, Calif., $3.75.*

Describes climbing routes and other helpful information on Glacier Park and includes 48 outstanding photographs.

ECOLOGY AND RECENT FORAMINIFERA, *by Fred B. Phleger, 1960, 297 pp., The Johns Hopkins University, Baltimore 18, Md., $7.50.*

This book brings together information on ecology and distribution of forams from

widely scattered papers with the advantage that the reader has a better perspective benefiting from the authors compilation and interpretation.

STUDIES IN PALEOBOTANY, *by Henry N. Andrews, Jr., 1961, 487 pp., John Wiley & Sons, Inc., 440 Park Ave. S., New York 16, N. Y., $11.75.*

This book is an introductory textbook in a field which has received growing attention and has assumed new importance in geologic studies of recent years.

SPECTROCHEMICAL ANALYSIS, *Second Edition by L. H. Ahrens and S. R. Taylor, 1961, 454 pp., Addison-Wesley Publishing Co., Inc., Reading, Massachusetts, $15.00.*

An updating and revision of the 1950 edition with special emphasis on new equipment, methods and techniques and discussions of spectrochemical developments.

BIBLIOGRAPHY AND INDEX OF GEOLOGY AND ALLIED SCIENCES FOR WALES AND THE WELSH BORDERS 1897-1958, *by D. A. Bassett, 1961, 376 pp., National Museum of Wales, Cardiff, Wales, 42 shillings.*

A comprehensive, well cross referenced bibliography of Welsh publications.

BIBLIOGRAPHY OF NORTH AMERICAN GEOLOGY, 1958, *by Ruth R. King and others, 1961, 592 pp., U. S. Geol. Surv. Bull. 1115, U. S. Gov't. Printing Office, Washington, D. C., $2.00.*

LEAD ISOTOPES IN GEOLOGY, *by R. D. Russell and R. M. Farquhar, 1960, 243 pp., Interscience Publishers, 250 Fifth Ave., New York 1, N. Y., $9.00.*

A monograph by the physicist-authors relating to the isotopes of common lead. Contains a number of tables of useful functions for calculations from measured lead isotope ratios.

P. E. LaMoreaux

New Georgia Society Elects Officers

After a series of organizational meetings, the Georgia Geological Society has been formed. It was originally conceived late in 1960 by N. H. Benton, a graduate student at Emory University, C. R. Smith, of Georgia State College, and others. Its purpose, according to the constitution, is "to advance the science of geology in Georgia." Monthly meetings were held during the formative stages, culminating in the most recent one in which officers were elected and a constitution was adopted.

The officers: Chester Smith, Ga. State College, President; Howard R. Cramer, Emory Univ., Secretary; Joseph T. Callaghan, U.S.G.S., Treasurer; Ernest Reade, Ga. Marble Co., Councillor; John Husted, Ga. Tech., Exper. Sta., Councillor.

LaMoreaux Named Alabama State Geologist

On May 1, 1961, P. E. LaMoreaux, former Chief, Ground Water Branch, U. S. Geological Survey, was appointed by Governor Patterson and President Rose of the University of Alabama to the position of State Geologist and Oil and Gas Supervisor. This appointment makes the incumbent the fourth State Geologist in Alabama since the beginning of the Survey in 1848. The Geological Survey was first headed by Michael Tuomey, who served for the term from 1848 to 1873 and contributed much to the description of mineral resources and development of Alabama. Dr. Eugene Allen Smith, State Geologist from 1873 to 1927, was responsible for coordinating work which resulted in defining much of the paleontology and stratigraphy of Alabama and the Central Gulf Coastal Plain. The first oil production and the establishment of the Oil and Gas Board came during the tenure of office of Dr. Walter B. Jones from 1927 to 1961.

The Survey and Oil and Gas Board are housed in two buildings on the University of Alabama Campus—Smith Hall, or the Geology Building, constructed during Dr. Smith's time, and a new Oil and Gas Board Building under construction at the present.

Four principal activities are carried out under the coordinated program of these two State agencies.

Economic Geology Division. Mineral resources investigations, including studies of sand, clay, gravel, limestone, coal and iron ore.

Water Resources. Studies of surface and ground water—quantity, quality, availability and use—under the Water Resources Division and a cooperative program with the U. S. Geological Survey.

Paleontology and Stratigraphy Division. Investigation of petroleum resources; preparation, recording and analyses of samples, cores, electric and Gamma Ray logs; maintenance of fossil collections; geologic mapping. This department enforces the Rules and Regulations, and Orders, of the State Oil and Gas Board.

Oil and Gas Board. The principal responsibilities of the State Oil and Gas Board are to prevent waste and to protect the correlative rights of landowners.

Publications of the Survey include an Information Series, Circular Series, Bulletins, Special Reports and Map Series, which may be obtained through Geological Survey of Alabama, Drawer "O", University, Alabama.

THE FUTURE'S MARKET

(Continued from page 13)

certainties should be clearly stated so early warnings of changes in the predictions can be more easily discerned. The present investigation of the future of petroleum geology opportunities by the AAPG is most important, and widespread communication of their findings will be even more important. Follow up studies to see if the predictions are on course should also be considered. Governmental agencies which now form large areas of earth science employment, and will undoubtedly become even more ramified, should also try to point out future needs and to widely communicate their findings. The world is predicated to growth. Whether this growth is to be erratic with cancerous and impoverished segments, or whether it will take on some efficiently planned direction will largely depend on our anticipation of the future. Prediction is not only a goal of the mystic, but the essence of science. Petroleum and economic geology have done eminently well in the area of reducing uncertainty from their predictions regarding the location of mineral wealth. It does not seem unwise to use some of this experience in predicting who and how many will be needed to do these jobs in the future.

The schools also have their challenge. The student following his own flaming curiosity is no problem. He is our best, and the most we can do is serve him. There are so few of these that they create no problem, they will make a job for themselves. But pure curiosity leads to many dead ends as well as the rare breakthrough. Most people are economic slaves to some greater or lesser extent of the society they serve, and perhaps this is as it should be. The society would have little corporate function if its individuals were without compromise. How then should we counsel the good students who are concerned with the future of the profession as well as their own curiosity?

We can inform them of trends in employment and special areas of interest so they can make their own decisions. We should encourage (or enforce) the concept that a good geology curriculum must be rooted in mathematics, physics, and chemistry, and then not forget this when we teach the advanced or graduate courses in geology. It's no wonder that the student of geology shies from a mathematical approach when many of his instructors lead the retreat. And at this moment I think we should be optimistic; enrollments have dropped below opportunities and new opportunities are now emerging, especially in water resources, oceanography, major construction of dams and highways, seismology in nuclear test spotting, and others too young to have names.

Falling enrollment often tempts departments into lowering standards and picking up a few students who are looking for the easy major. This is the worst solution, contributing to an empty prosperity, and generating the persons who someday will be culled from the profession during economic recessions.

But this all started as a prediction and has ended by preaching. Such is the nature of the species!

Dr. Albert Schatz, Chief of the Division of Microbiology at the Philadelphia General Hospital and Associate in Medicine at the University of Pennsylvania Graduate School of Medicine was recently awarded a $4000 *Dental Research Prize* by the Soil and Health Foundation of Emmaus, Pennsylvania. Dr. Schatz is internationally recognized as the co-discoverer of streptomycin and in dentistry is known for his revolutionary proteolysis-chelation theory of dental caries. His research approach to dental caries is that of a geobiochemist applying knowledge of the biological weathering of rocks and minerals to the problem of tooth decay. Among many honors which have been bestowed on him is the Drug and Allied Products Guild award, "Man of the Year" and the Junior Chamber of Commerce of the United States named him one of the "Ten Outstanding Young Men."

Dr. Schatz is a member of the Geochemical Society.

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POSITIONS WANTED

BOX 768. GEOLOGIST-MINERALOGIST, Ph.D., 31, family. Three years experience in major oil company research laboratory in fields of X-ray and fluorescence analysis, clay mineralogy and geochemistry of sediments. Broad graduate background in geology. Desires position at college or university. Available immediately.

BOX 774. GROUND WATER GEOLOGIST-HYDROLOGIST, 40, family. 1 year post graduate work. Five years experience with USGS, five years consulting. Geohydrology and engineering background with experience throughout U. S. Interested in position of responsibility. Open to foreign work. Resume on request.

BOX 786. GEOLOGIST, nine years experience in the Four Corners, Panhandle and West Texas. Broad exploratory background includes sub-surface, administration and seismograph. Some field and well work. Desires more responsibility.

BOX 796. ASST. PROF. Ph.D. Isolated State University wishes to teach in college or university in more desirable locale. Active researcher, Member professional societies, Bilingual, 5 yrs. varied governmental and industrial experience, 4 years teaching experience. Resume on request.

BOX 816. GEOLOGIST, M.A., Ph.D., Spring, 1961, 41, married. Three years part time teaching in major university (general, historical and structural geology) and ten years broad and varied domestic and foreign experience in petroleum geology including stratigraphic and structural investigations of continental scope. Desires stimulating teaching position with opportunity for research or imaginative research position in industry.

BOX 817. GEOLOGIST-PALEONTOLOGIST. B.S., 32, family. 8 yrs. experience in the West Texas, Texas Panhandle, and Four Corners Areas. Background includes subsurface geology, micro-paleontology and administration. Desires responsible position, domestic or foreign. Alert and willing to work to obtain such a position. Resume sent upon request.

BOX 824. HIGHWAY ENGINEERING GEOLOGIST, B.S., graduate school, 35, married, no children, 13 years experience with Federal & State governments in geophysics, foundation exploration, materials surveys—presently employed as Material Engineer with supervisory duties over compaction testing, aggregate production, concrete and asphalt control. Would like foreign or domestic work. Consider teaching assignment. Resume on request.

BOX 834. EXPLORATION GEOLOGIST, 35, highly varied experience in all phases of mapping, property evaluation, drill exploration, etc. 7 yrs. foreign experience in Africa, Guatemala, Mexico. Accustomed and delight in difficult assignments under adverse conditions. Speak Spanish. Seeking foreign position. Resumé on request.

BOX 835. GEOLOGIST, Ph.D. summer 1961, 30, family. Background (western U.S.) includes four-years mineral exploration and evaluation (metals, non-metals), two years stratigraphic research. Outstanding industrial references and academic record. Interested in economic applications of geology including petroleum. Opportunity of prime concern, salary secondary. Resumé.

BOX 836. GEOLOGIST, 29, Ph.D. expected 1961. Ore deposits, igneous petrology and geochemistry are main interests. Desires research position in either industrial or academic environment. Resumé on request.

BOX 837. ECONOMIC GEOLOGIST and MINERALOGIST—Ph.D. Almost 20 yrs. experience teaching and with the U.S. Geological Survey. Presently employed at a prominent Midwestern University. Interested in moving because of family and personal reasons. Would prefer location in the southwest either with a university or in industry.

BOX 838. GEOLOGIST, Ph.D. June 1961, M.A. in Geology, M.A. in Geography, 5 yrs. teaching experience as Ass't Prof. of Geology, Field experience with A.E.C., desires teaching position. Avail. Sept.

BOX 839. GEOLOGIST, Ph.D. with broad teaching background desires teaching position or museum work. Principal fields taught: structural geology, petrology, mineralogy, geomorphology, paleontology, economic geology. Can teach other geological fields and biology.

ENGINEERING GEOLOGIST, 30, 4 yrs. progressive experience with U. S. G. S., 2 yrs. experience in seismic & magnetic prospecting, 1 yr. of graduate school. Publications in ground water, Pleistocene geology, geophysics & drilling contract administration. Have partially supervised 15,000 feet of rotary & cable-tool deep water well drilling & hole sitting. Familiar with deep lift pumps. Available on short notice. Salary not of main consideration, desire more responsibility & varied experience, particularly in work dealing with people. Will consider short term assignment. Family. 722 N. Tonopah Dr., Las Vegas, Nevada.

BOX 842. ECONOMIC GEOLOGIST-GEOCHEMIST, Ph.D., 32, family, 7 yrs. experience all phases exploration, primarily metallic ores; at present NSF Postdoctoral Fellow. Desires stable position in exploration or geochemical research, preferably on ore genesis. Will consider teaching position with time for research. Resume on request. Available December, 1961 or March, 1962.

BOX 843. GEOLOGIST, Ph.D., 32. Desires responsible overseas position with aggressive engineering firm, minerals exploration, or petroleum exploration company. Polyfluent: Spanish, French, Portuguese. Six yrs. diversified surveys & petroleum exploration experience domestic, Australia, & Africa; also in geophysics, principally seismic. Specialties: field mapping, stratigraphy, geophysical interpretation, petroleum exploration, photogeology. Available October 1. Resume on request.

BOX 844. PRODUCTION GEOLOGIST, M.Sc., 35, family, broad graduate background in geology, 10 yrs. experience with major oil company. 3½ yrs. specialization in unitization, joint interest operations, & equity studies. Well versed in general sub-surface operations; mapping, and reserve estimates. Fair knowledge of log analysis, & reservoir engineering principles. Employed in South America for 7 yrs. Nearly bilingual. Will consider relocation in any of 50 states.

BOX 845. GEOMORPHOLOGIST, classical & quantitative techniques, also Pleistocene geology, hydrology, hydrometeorolgy, & air photo interpretation. Ph.D. 1957, major eastern university; 30, family. 5 yrs. experience teaching, research, thesis direction; field work every summer since 1953. Numerous publications. Desire university position in western university. Present salary $8,500. Available September or earlier.

BOX 846. GEOLOGIST, 28, single, M.S., 2 yrs. experience abroad major oil company; travelled extensively, 27 countries; fluent French, some Italian, German, Russian, Greek & Arabic. Experience in surface mapping, photogeology; writing ability. International Geological Congress, Copenhagen 1960. Will consider any position, preferably of short term contract, from July 15, 1961.

BOX 847. GEOPHYSICIST, Ph.D., Canadian, 32, married, desires position in exploration or research. Experienced in most types of ground and airborne prospecting methods. 3½ yrs. in Far East. Resume on request.

BOX 848. GEOLOGIST, 28; Family; 7 yrs. college; 3 yrs. in laterite—bauxite exploration in Africa and Central America; summers experience with Canadian Geological Survey and major oil company; presently working on Pleistocene problems; 2 summers field courses; minors in physics, chemistry, mathematics and 4½ yrs. Russian language; Speak Spanish. Seeks permanent employment either domestic or foreign; references and resume available; availability for work—immediate.

BOX 849. GEOLOGIST, M.S., 28, family, desires responsible industrial or teaching position. Currently engineering geologist; experience also in metallic minerals exploration, photogrammetry, teaching. Available one month's notice. Resume on request.

BOX 850. GEOLOGIST-PALEONTOLOGIST, 29, M.A., Ph.D. Sept. 1961, desires academic position in univerasity or industry with opportunity for research. Principal interests: micropaleontology, stratigraphy, paleoecology, petroleum and field geology. Two years experience with major oil company. Publications.

BOX 851. GEOLOGIST, PETROLOGIST, MICROPALEONTOLOGIST, B.A., M.S., plus 42 additional semester hours, 39, single. Training and experience in petrology and micropaleontology, 12 years experience in museum work. Graduate work in palynology, stratigraphy, petroleum geology, and protozoology. Desire teaching position in university or secondary school, preferably in south, southwest, or west, and Hawaii. Will consider industry position at home or abroad. Mastery of German and Spanish. Excellent references. Resume sent upon request.

BOX 852. ENGINEER, WATER—Extensive experience ground water control for construction, water investigation, water supply. Knows soil mechanics, hydrology, pumps, construction. Technical writing, research, sales engineering, design, supervision. MCE, PE (N.Y. & Fla.), 38. Desires to relocate out of New York City. Resume on request.

BOX 853. GEOPHYSICIST-GEOLOGIST, seven yrs. experience, family, well-sitting in four Appalachian states, seismic interpretation in five Appalachian states, desires permanent position.

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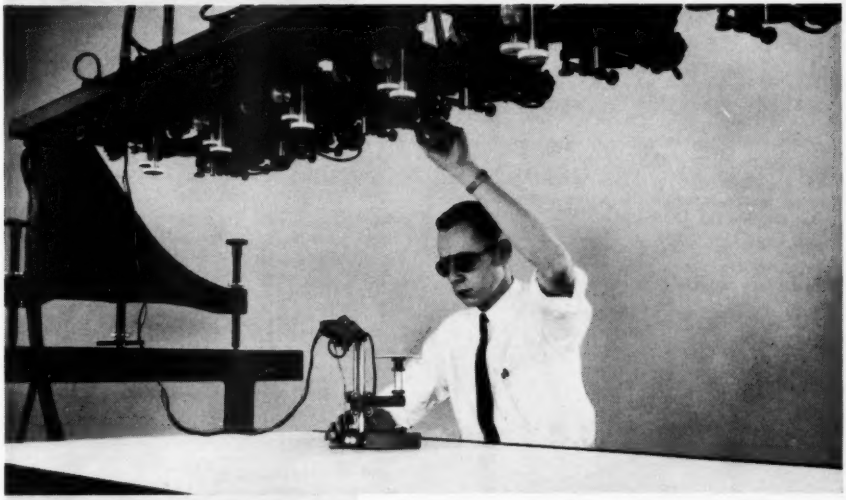

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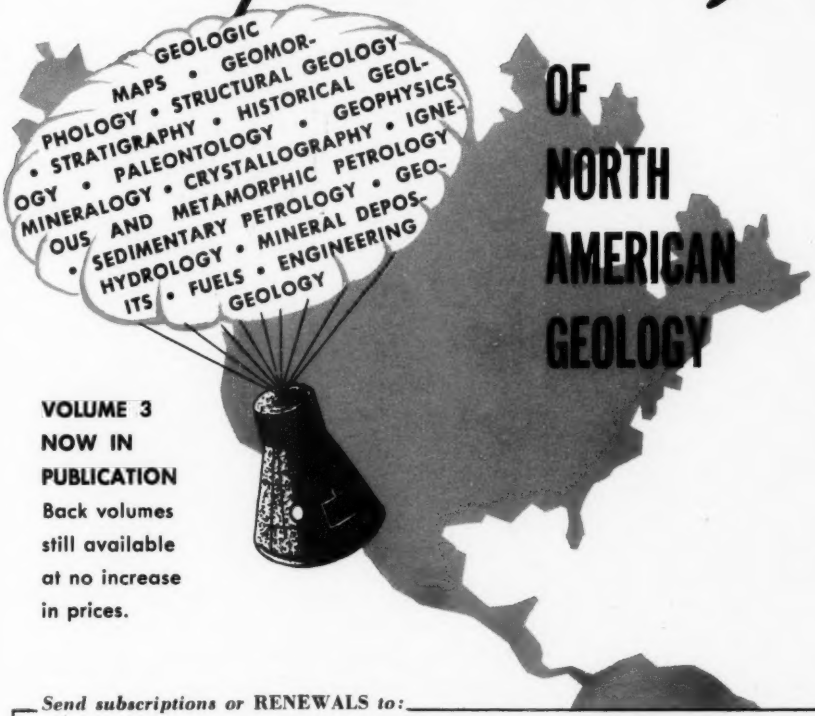

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